MECHANICAL ENGINEERING

· JANUARY 1948 ·

Whatever Fuel You Burn— You'll Save Money with BAILEY CONTROLS

Bailey Controllers of this type accurately measure and record the factors upon which controls are based.

You'll get high Economy, Safety and Availability because Bailey Controls, working from the accurate measurements of Bailey Meters, do the right thing at the right time.

Bailey Combustion Control

1. Secures instant response to changes in load by regulating both fuel and air at the same time.
2. Maintains optimum fuel-air ratio as measured by Bailey Meters.
3. Gives you the same complete control, when you change fuel, or even when you burn waste.

Bailey Three-element Feed Water Control

1. Reacts quickly and yet retains high stability by accurately measuring Steam Output and Feed Water Input and by controlling the rate of feed water input so that it equals steam output.
2. Surge resulting from severe load changes is held to a minimum by the action of flow ratio and level components which may be adjusted to conform with boiler characteristics and operating conditions.
3. Needs no excess pressure control because its operation is based in part on an accurate measurement of feed water input.
4. Power used by feed pumps may be reduced by applying Three-element Feed Water Control directly to pump speed.

Bailey Steam Temperature Control

Maintains uniform temperature by controlling primarily from boiler load and by readjusting from temperature.

Bailey Feed Heater Control

1. Gives smooth efficient flow through heaters because its multi-element action incorporates accurate measurements of both flow and level.
2. Permits the use of smaller storage capacity heaters and tanks thereby reducing the cost of initial equipment.

Bailey Pump By-Pass Control

Protects pumps by opening a by-pass valve when flow through the pump drops below the safe minimum value.

BAILEY METER COMPANY

1026 IVANHOE ROAD • • • CLEVELAND 10, OHIO

Controls for Steam Plants

COMBUSTION • PRESSURE
FEED WATER • LIQUID LEVEL
TEMPERATURE • FEED PUMPS

A-99-1

MECHANICAL ENGINEERING

Published by The American Society of Mechanical Engineers

VOLUME 70 NUMBER 1

Contents for January, 1948

ACCENT ON YOUTH . . . . . *E. W. O'Brien* 5
ATOMIC ENERGY AND THE ENGINEER . . . . . *D. E. Lilienthal* 8
HEAT TRANSFER IN INDUSTRY . . . . . *C. E. Lucke* 11
EMPLOYER PRACTICE REGARDING ENGINEERING GRADUATES—SUPPLEMENTAL REPORT . . 13
ASME 1947 ANNUAL MEETING PREPRINTS 38
TO ASME MEMBERS: THE COUNCIL REPORTS FOR 1947 41
ATLANTIC CITY SCENE OF 1947 ASME ANNUAL MEETING 49

EDITORIAL 3
BRIEFING THE RECORD 17
ASME TECHNICAL DIGEST 35
COMMENTS ON PAPERS 75
REVIEWS OF BOOKS 80
ASME BOILER CODE 82
ASME NEWS 83
ASME JUNIOR FORUM 91
CONTENTS OF ASME TRANSACTIONS 108

INDEX TO ADVERTISING PAGES 106

OFFICERS OF THE SOCIETY:

E. G. BAILEY, *President*

K. W. JAPPE, *Treasurer* C. E. DAVIES, *Secretary*

PUBLICATIONS STAFF:

GEORGE A. STETSON, *Editor* FREDERICK LASK, *Advertising Mgr.*

K. W. CLENDINNING, *Managing Editor*

PUBLICATIONS COMMITTEE:

H. L. DRYDEN, *Chairman*

J. M. JURAN JOHN HAYDOCK

R. B. SMITH C. B. CAMPBELL

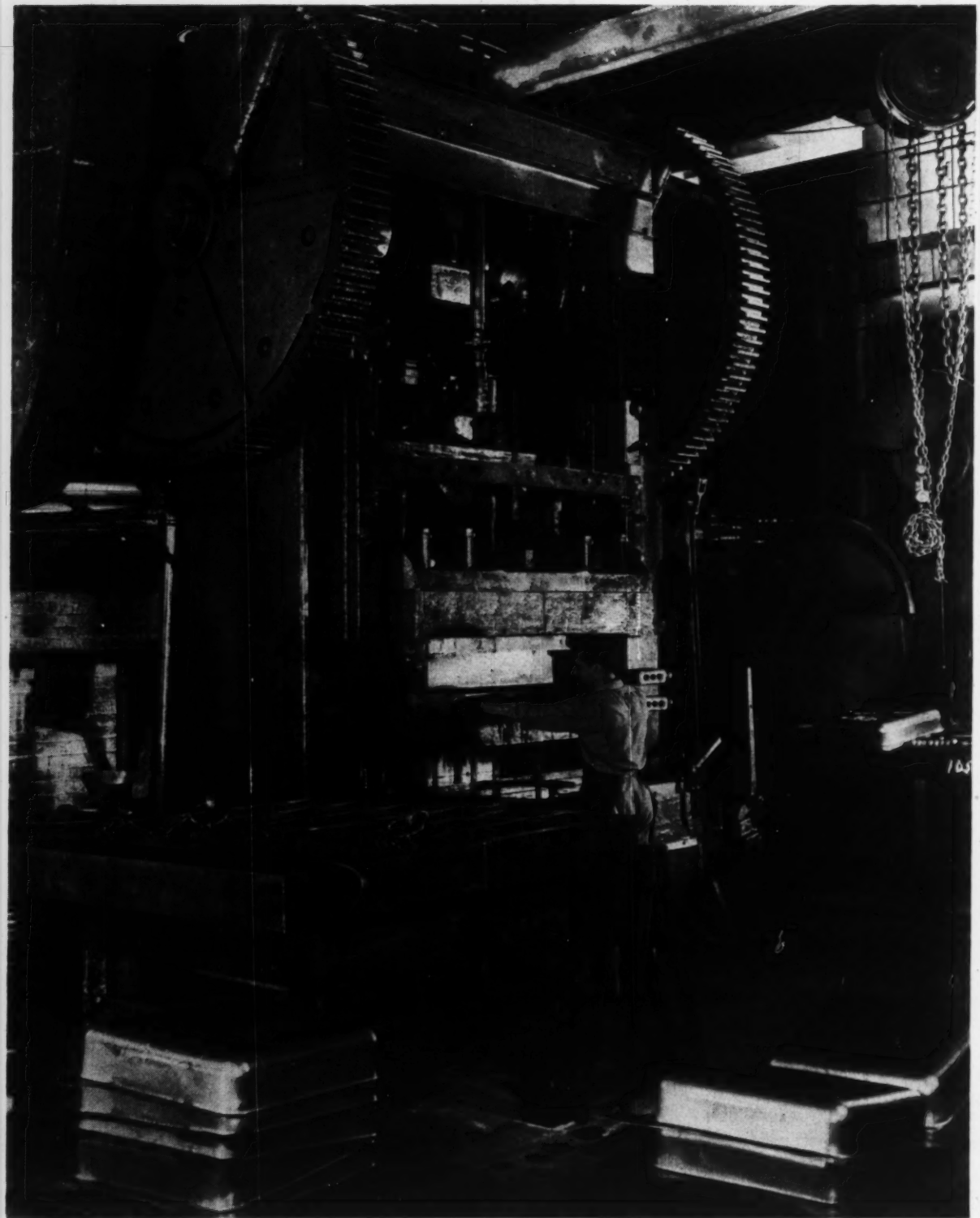
ADVISORY MEMBERS OF THE PUBLICATIONS COMMITTEE:

HUNTER R. HUGHES, JR., ATLANTA, GA.

Junior Members:

LOUIS FELD, NEWARK, N. J. JOHN H. PRENTISS, NEW YORK, N. Y.

Published monthly by The American Society of Mechanical Engineers. Publication office at 20th and Northampton Streets, Easton, Pa. Editorial and Advertising departments at the headquarters of the Society, 29 West Thirty-Ninth Street, New York 18, N. Y. Cable address, "Dynamic," New York. Price 75 cents a copy, $7.00 a year; to members and affiliates, 50 cents a copy, $4.00 a year. Postage outside of the United States of America, $1.50 additional. Changes of address must be received at Society headquarters three weeks before they are to be effective on the mailing list. Please send old as well as new address. . . . By-Law: The Society shall not be responsible for statements or opinions advanced in papers or . . . printed in its publications (B13, Par. 4). . . . Entered as second-class matter at the Post Office at Easton, Pa., under the Act of March 3, 1879. . . . Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized on January 17, 1921. . . . Copyrighted, 1948, by The American Society of Mechanical Engineers. Member of the Audit Bureau of Circulations. Reprints from this publication may be made on condition that full credit be given MECHANICAL ENGINEERING and the author, and that date of publication be stated.



Ewing Galloway

Stamping Sheet Steel Into Heater Casing Parts on 400-Ton Press

VOLUME 70
No. 1

MECHANICAL ENGINEERING

JANUARY
1948

GEORGE A. STETSON, *Editor*

Afraid to Ask?

DO employers encourage their engineers to take part in the activities of their professional societies?

One answer to this question, given by the employers themselves, is found in the report of the preliminary survey of the EJC Committee on Employer Practice Regarding Engineering Graduates. In that report, published in our issue of April, 1946, it was stated: "Practically all encourage membership in engineering societies. Nearly 30 per cent pay the dues of certain employees in certain societies. Traveling expenses are usually paid by employers for attendance at meetings when employees are authorized to serve on committees, prepare papers, present discussions, and the like."

Another answer has come from a junior member of ASME who writes: "Many juniors who are interested in participating more actively in Society activities are prevented from doing so because they fear that time spent in pursuing these activities will result in their being penalized by their employers."

Each of these answers is true. The engineering societies recognize that if the employers' answer were not true they would have to shut up shop, as a majority of the work of engineering societies is done by its members who are encouraged by their employers to do this work. The societies also know that some of their junior members feel that they do not get the encouragement they think they should have in taking part in the activities of their professional societies. Cases can be cited, however, which show that when the circumstances have been properly presented to an employer, his apparent indifference or opposition has disappeared.

It is fairly obvious that it is to the advantage of everyone concerned that young engineers be encouraged to realize to the greatest possible extent the advantages of active participation in the work of their professional societies. The employer, the profession, and particularly the young man stand to gain much more than the actual costs in time and money involved.

These generalities imply certain obligations and responsibilities on the part of each of the three groups involved. The engineering society cannot expect cooperation on the part of the employer if it does not provide the young engineer with opportunities for development and advancement that are worth many times the cost to the employer and to the junior. The employer must not take an offhand attitude and say, "The boy's a hard worker and deserves a holiday. Let him go." How much better to look upon it as an assignment, talk over the advantage to both, point out what is to be gained by the young man and the company, send him to a meeting, or encourage his participation in some other form of society activity, with the feeling that he is representing his company's as well as his own interests, and later discuss the results and the opportunities with him. And the young man must convince himself that his connection with his society is a phase of his professional development, on a different basis but quite as important in the long run as his daily work. If he is so convinced and if he has the courage of his convictions, he should have no fear in attempting to make his employer share those convictions. And he must be able to utilize whatever opportunities his employers permit him to enjoy to demonstrate that he has profited, that he is developing in stature as an engineer and as a man of maturity, and that his company is gaining, not losing, in prestige.

An engineering society prospers best and fulfills its functions when each of its members is contributing his knowledge, his experience, and his services as well as his dues. The more the member gives, the more he gets in return. The more rapidly he develops, the greater are his satisfactions. An engineering organization made up of men thus serving their fellow engineers and themselves, and the company employing engineers of this type, will be enriched, will develop as they develop, and will gain powerful esprit de corps.

The officers of industrial organizations and the supervisors of their engineering personnel have it in their power to reconcile the apparently opposing answers to the question, "Do employers encourage their engineers to take part in the activities of their professional societies?" by making sure that it is their policy to do so and that their young men and their immediate superiors understand it and are not afraid to ask them to live up to it. Encouragement implies an active and not a passive attitude. Young men should not be afraid to ask.

Employer Practice

IN our April, 1947, issue we published the report of the preliminary survey of the EJC Committee on Employer Practice Regarding Engineering Graduates which was based on questionnaires sent to a representative sample of companies engaged in several important fields. In this report, which was based on returns from 104 companies which employ upward of 34,000 engineers and about two million employees in total, data on training, starting salaries of engineering graduates, the percentage of engineers to other persons in adminis-

trative posts and in the officer groups of these companies, and the attitudes of employers to engineers were among the principal facts presented, and estimates of the need for engineers over the next few years were forecast. Comparisons were drawn between the results of the EJC survey and one that had been made a few months earlier by a committee of the American Society for Engineering Education. Late in the summer of 1947 another EJC Committee published an extensive report, "The Engineering Profession in Transition," which was summarized in our September issue.

In our current issue the Committee on Employer Practice presents a supplemental report in which the figures have been revised to include data from additional companies received too late for the first report. In this supplemental report the Committee also compares its findings with those revealed in "The Engineering Profession in Transition."

Salary data are obviously affected by unstable economic conditions in the postwar world. Average and median data are subject to considerable change from month to month and year to year. However, the different patterns found in several industries and the wide spread from low to high salaries in any one industry or group of industries reveal nonuniform practices of employers which should be given careful study if engineers are to be fairly treated and if companies and industries are to maintain quality of their staffs, because, obviously, young men are not going to be attracted into employment with companies or industries whose salary scales are low, or whose practices regarding engineering graduates are unfavorable, or with those which apparently afford limited opportunities for advancement. The engineering colleges are studying these reports and the significance of the data presented in them and undoubtedly they will lay the facts before their students. The result will be that the best men will seek employment where salaries and opportunities for advancement are most favorable. Experience has proved that companies and industries that were indifferent and neglectful of engineering graduates in the past have discovered that it is not easy for them today to attract good young men.

The Engineers Joint Council has rendered useful and valuable service to the profession, to the engineering schools, and particularly to employers of engineers in assembling the results of its two surveys and in making them available. Alert employers and educators are studying these reports and will make good use of the information in bringing their policies and practices into line with the trends indicated. Only thus can they build for the future.

Subscribe Now

THE Council of The American Society of Mechanical Engineers at the 1947 Annual Meeting held in Atlantic City, December 1 to 5, approved and ordered put into effect on Jan. 1, 1948, the new publications plan favorably voted on by the members in a letter ballot sent out last September.

Any change in Society procedure runs the risk of being misunderstood by members and hence the Council expressed its desire that every possible effort be made to inform the members. To this end frequent notices will be issued in MECHANICAL ENGINEERING and the membership will be circularized. The plan has already been outlined in these columns in past issues, and the original statement, sent to members in September, has been reprinted with such modifications to reduce expense and inconvenience as had been made by the Publications Committee up to the time of the Annual Meeting.

The purpose of the plan is to offer a new and useful service, to reduce waste in publication, and to reduce a rapidly growing publication expense. Briefly stated, the plan provides in MECHANICAL ENGINEERING a new department, "ASME Technical Digest" in which the readers will find, in brief form, the essence of papers presented at Society meetings provided authors have furnished manuscripts from which pamphlet copies can be made. Transactions and the *Journal of Applied Mechanics* are to be continued, but on a subscription basis.

It is this last feature which a member of the Society should understand clearly and which requires some action on his part if he wishes to continue to receive the Transactions, or the *Journal of Applied Mechanics*, or both. Every member will soon receive a notice about the new plan and a subscription form. Unless he does subscribe to either or both of these publications, he will not receive them. Hence it is strongly urged that every member who wishes either or both of these publications subscribe to them without delay.

In the current issue the "ASME Technical Digest" begins its career. By means of this department a reader will have brought to his attention all ASME papers except those published in MECHANICAL ENGINEERING. Copies of the papers briefed in this department may be purchased at low rates.

To ease the inconvenience of billing and payment of small orders, coupon books are now available.

It is the duty and the desire of the Publications Committee to conduct the Society's publications in the best interests of the Society. To do this it must consider the diversity of member interest, it must maintain high standards of quality, it must afford adequate outlet for the contribution of divisions, committees, and individual engineers, and it must spread its appropriation wisely in a time when publication costs are high. The Committee is convinced that the new plan gives the average member a better service than he has had in the past at less cost to the Society. It is recognized that some members may not be as well served under the new plan as they were under the old plan and that these members will have to pay more than they did before for what they need. This is a regrettable feature of the plan which gives the Committee much concern and to which it intends to devote much study. As experience with the new plan grows, the Committee hopes to discover ways of lessening the hardships some members may experience with it. To this end suggestions are invited. In the meantime, subscribe now to Transactions and *Journal of Applied Mechanics* if you need them.

ACCENT *on* YOUTH

By EUGENE W. O'BRIEN

PRESIDENT 1946–1947, THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

THE theme of this great meeting is "The Engineer's Responsibility in Increasing National Productivity." In these five days, many able leaders in industry and in various utilities will point out to you how application of the great productive capacity which we built up during the recent World War to peacetime manufacturing—to the development of comforts and conveniences and resultant higher living standards—can cure many of our current economic ills. They will suggest proved methods of attaining this end. These methods all require co-operative effort, and that today is the mercurial ingredient most difficult to secure, when and as wanted. Unfortunately, they involve not only the engineer, but many other elements—the banker, the lawyer, the worker. The engineer, in his various capacities of designer, producer, and distributor, just happens to be, the key-man in such co-operation.

In most cases this week we shall talk about the production of material goods and services. Tonight I want to talk briefly about the production of men, of personnel—the production of engineers of proper temperamental and personal background, as well as technical background—engineers who can lead us to the greater productive possibilities which we talked about so impersonally and impassively all this week. And I don't mean the production of engineers such as we older men profess to be, with such smug satisfaction. I have in mind the production of engineers who on the average are not so deeply embedded in rigid technical laws and inflexible formulas, nor so entangled within a rigid technical maze that they cannot be averagely human, that they cannot mix with and understand other people. We older engineers have served well in utilizing the materials of nature and in controlling its forces, but we have done poorly indeed in that other major function of our job as engineers—the directing and influencing and servicing of human nature.

This year I have visited some fifty Sections, some sixty Student Branches, over forty states, Mexico, and Canada. I have worked on all sorts of joint activities such as the Engineers Joint Council (EJC) and the Engineers' Council for Professional Development (ECPD). I have received over a thousand letters from junior members and student members on many subjects. My over-all reaction is a compelling belief that our greatest concern is, or should be, the proper professional and human development of these student and junior engineers, particularly the junior members of our national societies, into full-fledged members who will constitute a better profession and better societies in the near future. I don't believe that we older members, sponsors of these younger engineers, have been admitting, let alone doing, the comprehensive job which faces us. We haven't worked on this phase of professional production any more than have many workmen, of whom we complain, worked on our halting faltering production and distribution lines.

WHAT JUNIOR MEMBERS THINK

I wish I had time to read to you several score of cogent comments from young engineers. In many cases their opinions are but partly correct, their assumptions are but partly accurate; but they represent collectively an altogether too general belief which has weight and force and influence in their ranks. I'll read but one or two which have particular significance.

The first is from Victor S. Rykwalder, junior member, winner of last year's Charles T. Main Award:

Dear Mr. O'Brien:

I wish to thank you and the other members of the Society for making my recent trip to New York City so enjoyable. It was an inspiring pleasure to associate with such an outstanding group of men. I benefited immensely by the experience.

Of special interest to me was your impromptu after-dinner speech of December 4, in which you spoke straight from the shoulder on the welfare of the young engineers. There should be a larger group holding your opinion. To me it seems that a great deal more headway toward achievement of high professional standards could be made if more attempts were made to enlist and hold the interest of young engineers in a Society such as ASME. However, *I do not believe, from personal observation*, that too many of the "senior" group share in your opinions.

For the past few years I have had ample opportunity to study this condition during my attendance at engineering meetings. Usually, I find the older men don't care too much about consciously befriending, if you wish to call it that, the young engineers. At most meetings you will find the two age groups more or less segregated. Now, I don't believe the older men are inimical to the idea of younger men in the profession; and I don't think that the younger men are antisocial, either. Possibly there is no common ground within the Society and the profession for them to meet on. I believe, however, that most young engineers do recognize the value of the contacts they might make through a professional society.

For interesting programs, I think that our Detroit Chapter of Junior ASME is hard to beat. This has come about chiefly through efforts of Mr. Donald E. Jahncke, the present chairman. If you ever want ideas on this subject, I am sure he will be able to furnish you helpful information.

From a junior member in consulting work in the West:

The commendable work done by EJC could be multiplied a thousandfold if we engineers would practice what we preach—would get together and work together—would be professionally proud of what we do and tell other folks about it (for instance, this is the first I've heard about EJC and the grand work it's doing). . . . . Our professional and economic standing is based on what other people think of us, and what we do, and what we say about it, and how we act. We've got to be known, and to be known favorably we've got to be more human, more articulate—mix more with ourselves and with others—help each other and others, publicly.

I guess we youngsters are at fault in sticking to ourselves, but the example you oldsters set for us is none too hot. The reason I'm writing to you this way is because when you talked to us you didn't go brass hat—even told a story or two on yourself—we young fellows got the impression that you were almost human.

These young engineers and many more tell us that they want certain things. First of all, as becomes youth, they want action, not merely reports and surveys. Then they want protection—protection against unionization, protection against "trade-school engineers" as they call them, protection against a public opinion which does not give the engineer his full due, protection against an economic system that does not give him his full pay. They want educational guidance from practicing engineers both in school and, more important, in the years immediately after school. They want unification of the

Presidential Address delivered at the Annual Dinner and Honors Night of the Annual Meeting, Atlantic City, N. J., Dec. 1–5, 1947, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

profession and of its organizations. They often don't know what to join. They want the profession and the Society to take an active human interest in them, and participate in what they are doing.

It is my studied opinion that much of what they want and expect from the Society and from older engineers they can get of their own initiative and effort. But to accomplish this end they must be led into a position of co-operation and joint activity by older members and by the Society. They must become a significant working part in all of our activities. They must have occasional guidance, but still more a continuous continuing interest. They must be treated with a friendly family interest that is all too spotty at present.

WHAT ENGINEERS JOINT COUNCIL HAS DONE FOR YOUTH

During this year, Engineers Joint Council has done a remarkable job. That job, while for the profession as a whole, has been directed largely at the younger men. The Manual on Collective Bargaining which it put out early in 1947 was by far the best exposition of the rights of engineers under the old Wagner Act. Under this Act, the young engineer definitely needed protection and guidance. No engineer will regret that the passage of the Taft-Hartley Act made this manual, fine as it is, obsolete. It accomplished its purpose. Its accent was on youth.

The study made of Employer Practices of the 174 leading employers of young engineers in this country, under the chairmanship of your new President, Mr. E. G. Bailey, was designed to show these boys why and where engineers were used, how they were picked, how they were trained, how they were paid, how they were advanced, and why they sometimes failed to make top progress. It also measured future opportunity through the opinion of these major employers that they would need approximately 23 per cent more engineers in 1950 than they had in 1946. Its accent is on youth.

An ambitious EJC study on the Economic Status of the Engineer in which usable confidential questionnaires were received from approximately half of the 100,000 members of the six societies involved, is reported in the recently published book, "The Engineering Profession in Transition." This gives the economic return of engineers with respect to the degrees they hold, the branches they serve, the functions they fulfill, the ages they profess, and the nature of their employment. It should be invaluable to young men in planning their careers. Its accent is on youth.

The EJC Panel which sat in on the formulation of the Taft-Hartley Bill from the time it was laid out in preliminary form by Senator Ball and Representative Hinshaw, long before Congress met, had particularly in mind the protection of the young engineer. It sought four objectives: To give the engineer the right to elect whether he should be included or not included in collective bargaining; to prohibit the inclusion of nonprofessional employees with engineers in such bargaining; to provide, if collective bargaining were necessary, for collective-bargaining units made up solely of engineers; and finally, to insure that the engineer as an established professional man should always have the right individually to discuss terms of his employment with management.

When the question was raised in the final hearings as to why the engineer should not be excluded from the new act, along with the doctor, it became advisable to check with our membership as to its pleasure, despite the facts which showed that most young engineers become employees while most young doctors become associates—that the industrial plants of Mr. Bailey's study, which employed 40,000 engineers among over 2,000,000 employees, employed less than 300 doctors—that almost negligible attempts had been made to organize doctors while very extensive efforts had been made to organize engineers.

You know the results. In the case of the AIEE members, 16 per cent of the more than 20,000 returns felt that engineers should be included and should be protected. In our own Society, 24 per cent felt that engineers should be included; and when we asked a second question—whether engineers should be included if the safeguards I mentioned a few minutes ago were included in the bill—46 per cent felt that they should be included. This last was still negative, but over two thirds of those in the classification affected, young engineers and those in nonsupervisory work, felt that they needed the protection of such an Act. So EJC persevered. Against an overall negative vote, they took positive action, for the protection of the young engineer. Emphasis was on youth.

As much from the figures and ratios determined from these questionnaires as from the various letters which they developed, it became quite apparent that many of our junior members—and remember that they are presumably the pick of our young engineers—felt that they needed representation in their public and professional relations by someone more articulate and more forceful than they themselves. They lacked self-confidence in this respect. It was also apparent that they did not altogether trust management, with many instances of poor management to point to in justification. Above all, it was quite apparent that few of these young engineers had a true sense of professional consciousness.

It is this lack of proper appreciation on the part of our junior members that they belong to a real profession, that most concerns me. It results from a great many errors of omission by our older engineers, by our colleges, and by our societies. Schools in particular have a real job to do in overcoming this lack of appreciation. They have to instill into the minds of their students from the time they enter college that their objective is membership in a profession that is just as great, just as honorable, just as productive and historic in its service as any other profession. They have to emulate the medical and the law schools in this respect, for from the time their students enter school, they are impressed with the sanctity of their chosen profession. Accent must be upon youth.

The Engineers Council for Professional Development, so-called ECPD, has this problem definitely in mind. Under the able leadership of our own past-president, James W. Parker, it has taken new hold this year, after an unavoidable lull in activity during the war years. It is reinstating the program of visitation and the accrediting of schools and is proceeding vigorously with its postgraduate development program. The ASME is co-operating wholeheartedly in this program. ECPD accent is on youth.

THE ASME JUNIOR PROGRAM

Our Society has its own broad job to do. We are trying to do it in large part through what we call a junior program, which is just getting into stride under the leadership of three active Junior Members: the Don Jahncke of Detroit, mentioned so favorably by Rykwalder as chairman; Phil Allen, who has headed a very successful Philadelphia junior program; and Charlie Carman, who has headed a similar program in New York. These young men are able and imaginative; they know the minds of their fellow youngsters and they know the processes of the Society. They are aided by two older members long interested in young engineers, Hugh Thuerk, president of New Jersey Power and Light Company, and George Thom, director of personnel relations and training at Sun Shipbuilding and Dry Dock Company. Our "Old Guard" is helping to underwrite their program.

It is their task to locate, to interest, and to inspire these young men into active participation in professional and Society affairs, and to tell us older members how we can co-operate.

They are to determine a program which will intrigue these younger men, to develop means of co-operative action between the old and the young, to give junior members a chance to work out and solve for themselves—which is always best—the problems which face them, but which they feel in many cases should be settled by us older men or by the Society. Their accent will be on the development of self-reliance and the humanizing of our intersociety relations.

This committee has already set up a comprehensive plan to trace young engineers from student membership into junior membership and through the various early jobs they hold. They have also set up a ten-point program which has just been announced to the Sections. It is expected that local committees similar to this national committee will promote activities in each of our Sections and in our Professional Divisions. They hope and plan to bring these younger members into major activity, for their sake and for our sake. Accent is on youth, from the Council to the Section and Student Branch.

But any movement of this sort is dependent upon wholehearted co-operation at the grass roots, the friendly and participating interest of all concerned. We older men, who are inclined to sit back somewhat smugly and rest on our laurels, must get down off our high perch and mingle, and work, and "bat the breeze" with these younger fellows who are to be our successors. We have much to be proud of in our engineering accomplishments, in our codes and our standards, and our processes and our procedures, but we can readily look around and realize that we have accomplished this as an organization and as a society with but half man power, for there are more now qualified for membership outside of the Society than inside. And if we check a little further we'll find that many of those now outside were once student members or junior members, but found so little of interest in the plastic years of their junior membership that they dropped out, and their influence, their efforts, their thoughts, and their acts have been lost to us, in most cases irretrievably. We don't want the same thing to be true twenty years hence. We want a profession and a Society that will have much broader support than now, but above all, a profession and Society that appreciate the humanities as well as the technicalities. Hence our accent on youth.

THE PROCESSION TO THE DAIS FORMS FOR THE 1947 ANNUAL HONORS NIGHT DINNER OF THE ASME

(Officers and medalists of The American Society of Mechanical Engineers line up for procession to the speaker's table at the Annual Meeting Honors Night Dinner at the Chalfonte-Haddon Hall in Atlantic City Wednesday, December 3. They are, left to right: Ernest Hartford, executive assistant secretary; C. M. Allen, marshal; L. W. Wallace, chairman, Board of Honors and Awards; J. P. Den Hartog, Richards Memorial Award; R. C. Martinelli, Melville Medal; Paul W. Kiefer, ASME Medal; Francis Hodgkinson, Honorary Membership; E. G. Ackart, Honorary Membership; E. W. O'Brien, president; B. R. Van Leer, toastmaster; E. G. Bailey, president-elect; Harvey N. Davis, Honorary Membership; A. L. Nadai, Worcester Reed Warner Medal; Alvin E. Dodd, Gantt Medal; David Cochran, Pi Tau Sigma Medal; William R. Collier, Undergraduate Student Award; C. E. Davies, secretary; J. M. Todd, marshal.)

ATOMIC ENERGY *and the* ENGINEER

By DAVID E. LILIENTHAL

CHAIRMAN, U. S. ATOMIC ENERGY COMMISSION

FIVE years ago today, amidst the deepest secrecy, there occurred an event of such dramatic significance that it immediately placed its imprint upon the life and future prospects of every human being upon this earth. For this day is the fifth anniversary of the first self-sustaining nuclear chain reaction.

On Dec. 2, 1942, in a makeshift laboratory under the stands of the athletic field of the University of Chicago a group of scientists directed by Enrico Fermi demonstrated for the first time that the vast energies within the nucleus of the uranium atom may be released, and upon a large scale, and that such release of energy may be controlled by man.

The world will never be the same since that day.

This dramatic discovery was not, of course, the product of some single new addition to knowledge. Back of this event is a long history of generation after generation of inquiring minds, restless, questioning, testing, doubting, probing, seeking after the truth about the nature of the physical world, about the procession of the seasons, about the sun in its power and warmth, about the very stars in their courses.

Was this proof of five years ago that man could release the basic energy of matter, was this an event over which we should rejoice, or should we tremble with apprehension, and pour upon our heads the ashes of remorse that mankind should have let out of the bottle an evil genie too powerful to be tamed? We are in no position to judge of this question, for the time has been too short. What would we say today: Is fire a discovery to be regretted? Of course not. There is hardly a force more beneficent in the life of man, though when fire is out of control it can and does cause catastrophes of the most horrible and devastating kind. We have learned to live with fire. Indeed we can hardly imagine our civilization in its best aspects without it. But if the only time you had ever seen fire was in battle, pouring out of a flame-thrower, consuming human life, even that of our enemies, or dropped from the air to burn to a cinder a city of a million people, if that is all you knew of fire I wonder if you would know enough to be sure whether it had been a good discovery. Our perspective about atomic energy is also not too clear today. We are still too close to the event.

Only when we have more of that perspective which time and experience alone afford shall we be able to say with any assurance whether this new knowledge more greatly serves mankind and the forces of good than it serves evil. The issues and the decisions that center about this ethical tug of war over the uses to which atomic energy are put may prove to be the principal events of our lifetime.

The event of five years ago today is of importance to every one of us. But there are very particular reasons, so it seems to me, why this husky infant, atomic energy, should be of the greatest interest and concern to you and to the whole body of American engineers.

Contributed by the Nuclear Energy Application Committee and presented at the Annual Meeting, Atlantic City, N. J., Dec. 1–5, 1947, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

You engineers are probably the largest group of technically trained and technically experienced men and women in the country—the group of citizens who as much as any other account for our industrial position in the world, which is the foundation of our military position.

The reasons for your special interest and particular responsibility in respect to atomic energy are three:

First, here is a new going industry the atomic-materials industry, largely built and operated by and presently being improved through engineering skills.

Second, looking ahead, here is a vast new field of technical knowledge opening up before our very eyes, at a rate that is probably without precedent. Your fellow citizens look to you for the manifold applications of this new knowledge, for such is the traditional role of the engineer.

Third (and this I believe to be the most important), atomic energy is not only science and engineering; it is one of the most vital of all areas of public policy, in which as a people we must make decisions affecting the course of the Republic, the peace of the world, and the future of our twentieth century. If these decisions are not to be made in panic, if they are not to be master-minded, or not crammed down our throats at some future time of emergency, if in short they are to be made by the democratic process, then *the people as a whole must be adequately informed* of the essential facts of this new force and of its meaning to laymen. This education in the essentials of atomic energy must not come from a centralized official source, but instead, in so far as possible *from within the communities and neighborhoods of America*. Your neighbors have a right to look to you engineers, as technically trained men, for help in understanding in lay terms this new field of knowledge, and for guidance in determining its meaning for human life and public policy.

I

The five members of the United States Atomic Energy Commission, as trustees for the people of the United States, are in the business of transforming the mineral uranium into fissionable materials, that is, substance that will maintain a chain reaction. This is a huge industry and one of great complexity. The Commission's operations and its interests extend into most of the states of this country, and to far distant parts of the world. The nation now has expended in the order of two and a half billions of dollars in the enterprise; if this country really means business, then within the next several years this total expenditure will increase to approximately five billion dollars.

The materials that enter this operation by truckloads come out, as an end product, in teaspoonfuls. The end products are two. One is a form of uranium known as U^{235}—meaning that rare isotope having the atomic weight of 235. The other product is plutonium, a new man-made element. Both of these products are used for atomic weapons, in current production and under design at Commission laboratories. These same end products are also used for research reactors and will be used in power reactors when such have been designed and built.

I have in my hand a piece of the raw material with which this whole business begins. This is a piece of very rich uranium ore from the Belgian Congo. Until recently it was of little commercial interest. As a result, there was almost no exploration for it anywhere in the world. Today this is hardly the case! So the Atomic Energy Commission's responsibility begins with exploration for and mining and transportation of this unique material from those points where it can be found in favorable concentrations. Then the ore must be milled and treated to recover the uranium as a pure metal or as a pure chemical compound. As a pure metal this is the way it looks: this black very heavy material—much heavier than lead—this is a cylinder of pure uranium. Only a few years ago there was not this much uranium metal of this purity in the whole world; today we use it by the ton. This black cylinder is a central issue in the councils of the world today.

In this cylinder, which is about four inches long, there are three million billion billion atoms and each of these atoms has a nucleus. If the energy in each of these nuclei were released through the fission process—that is through the splitting of the nuclei thus making two nuclei where one grew before—this cylinder of uranium which I hold easily in my hand would yield the heat equivalent of more than 2500 tons of coal. But much work must be done before this can take place. At present only one atom in each 140 atoms of this cylinder can be made to yield its energy in this way. So it is necessary to separate out this rare atom that will fission—this one 140th of the natural pure uranium—from the 139 parts that will not fission.

Now this is not a simple chemical process. It was to separate the uranium 235, which is fissionable, from the uranium 238 in this cylinder, which is not fissionable, that the enormous plants at Oak Ridge were constructed and are being operated today. One of these plants is one of the largest industrial operations under one roof. The Commission's operator is Carbide and Carbon Chemicals Corporation.

There is another way of making fissionable materials for weapons. That is to take natural uranium as it is in this cylinder and after canning it in a very special way to protect it from corrosion, to put it in a nuclear reactor, known as a pile, and in that pile transmute the uranium into another element entirely, the fissionable element plutonium. This changing of uranium into plutonium takes place in a huge plant of the Commission's at Hanford in eastern Washington, operated for the Commission by General Electric Company. This pile operation is but the beginning of a long and difficult and exacting series of processes. For this uranium becomes violently radioactive in the reactor and must be handled entirely by remote control behind enormous walls of concrete. To separate the transmuted plutonium out of the slugs of uranium metal that have been discharged from the pile is a very touchy task of engineering. This plant at Hanford was designed and constructed by the du Pont Company. It was because the United States had an industrial unit with the skill and experience and drive of the du Pont Company and the scores of other concerns associated with it in this enterprise that plutonium was produced on a huge factory basis in a matter of months. In order to put the huge plants at Oak Ridge and Hanford into production with a swiftness that still commands the awe of the world, scores of engineering problems of unprecedented complexity had to be licked and they were licked—by engineers.

At Hanford, and at other production and development centers, the Atomic Energy Commission is in the midst of a large-scale program of expansion of facilities, major improvements of plant, and refinements and new developments. In this undertaking—which is a major effort even for this country—the Commission and its associated industrial contractors need and must secure the active co-operation of American industry.

The next step in the operation of the Atomic Energy Commission is of quite a different kind. This involves the actual fabrication and assembly of an atomic weapon.

The making of weapons themselves takes place on top of an isolated mesa in the mountains of New Mexico at Los Alamos. It is at this point that the Atomic Energy Commission's responsibilities for the design, development, redesign, and improvement of atomic weapons is carried out. This is not a factory job. It is a very special undertaking in which scientists and highly skilled technicians rather than mechanics and machine operators are involved. This work employs mechanisms that call for scientific, industrial, and engineering skills of the highest order.

Whether atomic energy is used for peaceful purposes, such as the production of power, or for weapons, the same steps and processes and industrial activities are required up to the point where at Los Alamos an actual weapon is put together. The atomic industry of the future, we may hope, will be confined only to peaceful uses. It has been the purpose and course of this country to seek workable, effective, international arrangements that would insure that result and in the name of common humanity to be content with nothing less.

II

Thus far the public has heard most about the role of the scientist. We of the mid-twentieth century are the first to enter an unexplored sector of the physical world, about which even the best atomic scientists in this—the first wave of pioneers—are still profoundly ignorant. All over the country the Commission is encouraging and supporting essential research as well as the training of young blood, in extensive laboratories owned by the Commission and in universities.

But the *application* of new knowledge calls for at least as great an effort as its discovery. For example, the development of a power reactor as a source of heat for industry and for generation of electricity is a project in science and engineering of the highest order of importance.

The Atomic Energy Commission believes that in this development the participation of the engineering profession must be broadened despite the extraordinary difficulties that secrecy at this time imposes. We are determined to find ways to increase industrial participation in this and other fields of engineering application. As one of the several steps in this direction the Commission has recently secured the assistance of an outstanding group of men, who are now examining virtually the entire undertaking. This group is headed by the president and general manager of The Detroit Edison Company, James W. Parker, and includes among its 11 members such well-known engineers as Oliver E. Buckley, president of the Bell Telephone Laboratories; Robert E. Wilson, chairman of the Board, Standard Oil Company of Indiana; Isaac Harter, executive vice-president and director, The Babcock and Wilcox Tube Company; Donald Carpenter, vice-president, Remington Arms Company; Bruce K. Brown, president, Pan American Petroleum and Transport Corporation; Gustav Egloff, director of research, Universal Oil Products Company; Paul Foote, executive vice-president, Gulf Research and Development Company; Gabriel O. Wessenauer, manager of power, TVA; Jerome C. Hunsaker, chairman, National Advisory Committee for Aeronautics; and William Francis Gibbs, Gibbs and Cox, naval architects and marine engineers. So that they may work effectively the Commission has taken the unusual but necessary step of giving the members of this group access to restricted data and an inside look at the problems that face the Commission.

III

It is in his capacity of citizen-teacher rather than as a professional man and technician that the role of the engineer in atomic energy may prove to be the most important.

Bear in mind that the development of atomic energy—from ore through production of end products, and including most research and development—is today a business wholly owned by the Government of the United States and is a monopoly by explicit provision of law. This condition is not likely to change very much so long as world conditions remain as they are. The reason is a simple one: That the peaceful and the military aspects of the development of atomic energy, are, as a matter of *physical fact*, not possible of effective separation.

The public, then, is the owner and the boss. It is obvious that the boss and proprietor of so complex a scientific and engineering undertaking should be an informed boss, if there is to be in this industry a high standard of management and technical competence.

Even more important is the bearing of public understanding on these grave decisions of broad public policy that the people of this country will be called upon to make. Such decisions may be made in the darkness, in ignorance and hysteria and panic. Or such decisions may be made upon the basis of widespread public understanding and steady judgment. The difference between these two may hold quite terrible consequences for us all.

Now against this background let me cite a particular example or two of areas of public policy and public education in which the engineer is uniquely qualified to assume leadership in his community and among his nonengineering business associates.

Take the matter of secrecy. It is generally assumed by those unfamiliar with *how* scientific and technical progress comes about—especially in a democracy such as we enjoy—that secrecy and security are synonymous. The more secrecy the more security. And by security I am of course referring to our national security in the military sense. In the case of atomic weapons, the very circumstances under which the bomb was first developed, during the war, and the colorful publicity about the "secret" project has planted the idea rather firmly in many people's minds that we have a Secret Formula For The Atom Bomb, and if we keep that formula in a huge safe, away from foreign spies and domestic traitors, we have "kept the secret" and our security is well in hand.

Now the fact is that secrecy, applied in a stupid and hysterical and demagogic way, can actually impair and weaken our security. This may be a shock to some people; but it is true, and most of you know it is true. We are working in a scientific and technical field, in which it is of the utmost importance that we develop new ideas—new scientific ideas, new engineering ideas. The plants at Oak Ridge and Hanford were erected in the greatest of haste; it is obvious that they are not the last word, that great improvements are not only possible but essential and urgently needed. The bombs thus far detonated are the very first products. You know as engineers that the first output is almost certainly not the apex of development. Our prospects for developing useful power from nuclear fuels can be a great asset to this country, an asset in a military and naval sense—a nuclear-propelled submarine is one illustration—and in an industrial sense nuclear power's ultimate importance can hardly be exaggerated.

But we need ideas if we are to keep our lead and increase it. Where will the ideas that will push us ahead, rapidly, come from? In what kind of soil do new ideas grow? In this country we have relied upon competition, with the free use of information, the broadest kind of competition, and the cross-fertilization of many minds. New ideas require not only inspiration and perspiration but information. Think over the great modern technical achievements and imagine for yourselves how secrecy and compartmentilization and monopoly would have slowed up, perhaps smothered them. One need go no further afield for a case in point than the chain reacting pile and the atomic bomb. It was the fact that over a period of years before the Manhattan District, many, a very great many, scientific minds were so well informed that it was possible in so brief a time to achieve these landmarks.

So it is vital that the public understand that we pay a price for secrecy in the technical field; that if we were to impose secrecy unintelligently, *the price of secrecy in terms of our own military security* would then be so high as to impair rather than strengthen that security.

In the Atomic Energy Act, the Congress directed the Commission "to control the dissemination of restricted data in such a manner as to assure the common defense and security." The Commission is carrying out this mandate; it is continuously working to strengthen the means of protection of restricted data. This is a high duty, but it is abundantly clear that the "common defense and security" are not furthered—indeed, they are weakened—by secrecy that does not protect but only hobbles this nation's own efforts toward security.

Now considerations such as these I have mentioned are not well known among the public as a whole. Many of our best-intentioned people believe, without having thought about it much or at all, that secrecy in technical matters costs us nothing in a security sense, and that therefore it is just a simple matter of keeping one's mouth shut and his plants and papers well-guarded. This is required, but it takes far more than that.

The commission takes this occasion to warn you, in a most earnest way, that if this country is to maintain its pre-eminence in all phases of atomic energy, weapons and peacetime applications alike, the policy of the country must take into account *how scientific and engineering progress is made*. That requires far greater public understanding than now exists. No one is better qualified than the great body of American engineers to assume leadership in educating the public in such matters as these.

It is inevitable that any release of information concerning atomic energy will lead to differences of opinion, expert and lay, about the inclusion or exclusion of this or that particular piece of information. On the one hand there are the advantages that will accrue to us by reason of greater knowledge among our own people; on the other hand, there are the possible advantages that such information may afford rival undertakings elsewhere. Out of a balancing of these, one against the other, comes the answer; and there is often room for disagreement as to how the scales read.

The issuance of the Smyth Report itself is a good illustration of this process. There are those who feel that some particular items of information made public in that report had better have been left out, that the balance of advantage weighed against the inclusion of those particular items. But it is hard to conceive of any such report in which differences of judgment as to this or that piece of information will not inevitably arise.

Such qualifications notwithstanding, it is my opinion that there had to be a Smyth report. Weighed as a whole, the Smyth report is an example of the release of information that is in our own interest; without which not only would our own technical progress have been hampered, but the formulation of intelligent public policies rendered well-nigh impossible.

To this nation's engineers, trustees and practitioners of the great skills and imagination of engineering let me say this: once again the country looks to you to serve the interests of

your nation and of humanity. You as much as any body of citizens can help to dispel public confusion—a crippling confusion—as to the true relationship between secrecy and genuine security. And your professional talent for clear, unadorned exposition and for the training of others may help to give to all Americans an understanding and a feel for the fundamentals of atomic energy. This is the bedrock that must underlie and support sensible, sound, public judgments on the policy issues that increasingly center around this new force.

It would be nothing short of a major national catastrophe if, through lack of an informed public opinion, America's atomic enterprise should drift into the doldrums, should fall prey to ignorance or panic or indifference or petty politics. The engineer is well called "the enemy of error." There is no group better qualified than the engineers of the country who can supply leadership in public education in these matters, so that the country can continue to develop in this field with vigor and with a high standard of technical competence.

HEAT TRANSFER *in* INDUSTRY

By CHARLES E. LUCKE

STEVENS PROFESSOR EMERITUS OF MECHANICAL ENGINEERING, COLUMBIA UNIVERSITY. FELLOW ASME. CONSULTANT, WORTHINGTON PUMP & MACHINERY CORPORATION, HARRISON, N. J.

INDUSTRIAL operations use heat-transfer processes very widely, and it is doubtful if the dependence upon such processes is exceeded by any other kind.

Therefore it would seem that the Heat Transfer Division has a great opportunity for usefulness and this imposes a professional obligation to make the most of that opportunity in the public interest.

Considerable progress has been made in this direction, but there is no justification for a complacent attitude. There is too much misleading information in circulation. This must be exposed and corrected. Even more important is the necessity for filling the many gaps in the information required to produce heat-transfer equipment which will be satisfactory to the operators who use it. Plans must be made to guide this activity.

INFORMATION ON HEAT TRANSFER SHOULD BE GIVEN PUBLICITY

There is evidence that the really great scope of industrial applications of heat transfer is not realized by enough people; and in the interest of essential co-operation by all concerned, this situation must be corrected. This Division submitted a classification of heat-transfer processes, with apparatus for each class, to a Federal agency which requested it during the war, as a basis for an engineering job classification. This classification should now be given wide publicity after such revision as might seem to be necessary, as a definition of heat transfer for engineering activities.

To meet the requirements of industry for heat-transfer operations, someone must design and build equipment for the operator, who most commonly is not the designer or manufacturer, and who ordinarily buys it in a competitive market to meet his specifications of operating conditions and price.

This Division is the proper place for the reporting of information required by the designer to produce the equipment, and of the information needed by the operator to use most effectively the equipment designed for him.

The designer is the keyman, so the efforts of all must be directed toward supporting him by the development of such information as will make it possible for him to produce better designs, e.g., equations, formulas, graphs, and tables.

Just how this is to be accomplished by this Division is something for its officers and subcommittees to decide but suggestions from any member should be in order.

Presented at the Heat Transfer Division Luncheon, at the Annual Meeting, Atlantic City, N. J., December 1–5, 1947, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

This does not mean that sound theories or rational relations of proved validity are objectionable. On the contrary, they are absolutely essential. However, nothing could defeat this objective so effectively as the use of this forum for publication of vague theories by speculative people whose interest is self-glorification or promotion of some special interest instead of public usefulness.

Reports by operators giving factual data on the results of the designers' efforts, and reports by designers on their experiences—bad as well as good—within allowable competitive limits, would certainly be in order. Such factual data constitute material for testing the validity of theories, without which, correlation of data would be delayed or perhaps would be impossible. So far, too small a fraction of our papers have been concerned with the factual type of information, and both operators and designers have been too small a part of our active membership.

In dealing with this problem of developing heat-transfer knowledge of the kind that will result in betterment of old types of equipment, and in getting useful new kinds through the designer, recognized as the keyman, those things which would help should be supported, and other things at least denied support, but preferably be attacked or suppressed. Some suggestions in this direction are submitted for consideration.

Acceptance of the ideal of applying rational analysis to the factual data of tests or of daily operation, to widen their scope of applicability and utility, is one of our great achievements. However, its value in any particular case depends upon the accuracy of the observational fact data, and on the soundness of the reasoning used as a basis of analysis, and the correlation of data. Of course validity of any conclusion, usually an equation, must be proved and not assumed.

As to the matter of reasoning, and recognizing that any such valid equation is a law of Nature, the following quotation from Mellor (Chemical Statics and Dynamics) is significant and true: "No process of reasoning can establish a law of Nature. The elements of sameness—the law—must be actually discovered in the facts."

The procedure of applying rational analyses to fact data to derive an equation of rational form, accounting for all of the potent variables and with empirical constants, has so far been applied mainly to the unfired class of heat-transfer processes. The fired class of processes has received very little attention.

In the most common use of the method in the unfired class of processes, an equation is sought for each individual conduct-

ance or resistance, and for the over-all conductance or total resistance when there are two or more in terms of each of the individual components. As noted, some of these equations in circulation give results that do not agree with facts known to designers and operators. For many conditions there is no acceptable equation, so reliance must continue to rest upon empirical relationships of cut-and-try methods, if the designer is to guarantee performance as specified by the operator.

CAUSES OF ERRORS IN EQUATIONS

Some examples of the causes of error or inapplicability of these published equations are worth repeating:

Incorrect measurement of hourly heat transferred, Btu per hr. In very few cases has the measurement been made of both the heat lost by the source and that gained by the receiver to obtain a satisfactory heat balance. Without a close heat balance there is no proof that hourly heat, which is the prime variable in the calculation of conductance, is correct.

The area of heat-flow path between source and receiver to which thermal current, Btu/hr/ft^2, or conductance is referred, may not be determined correctly, or may not be measured in the same way in different cases by different people. Quite often the surface of a metal wall is not all active, and the inactive fraction is unknown or variable.

The mean temperature difference between the source and the receiver is rarely the subject of temperature measurement along the path of flowing fluids, or over the surface of a wall dividing the fluids. It is more often calculated by a formula from initial and final temperatures, the derivation of which is based on hypotheses when the assumed conditions differ from the real conditions. The value of mean temperature difference used for calculating a conductance is often without proof of its accuracy.

In small-scale laboratory apparatus tested to get data for a conductance equation in terms of the controlling variables, the conditions of full-scale equipment may not exist, and consequently the formula, even if valid for the supposed model, is inapplicable to design. Similarity assumed to exist may not exist and in some cases cannot exist.

No equation of relations resulting from correlation of observational data where there is a high and a low limit of each controlled variable, can be accepted as valid for values of these variables down to zero or up to infinity. All such equations should be reported with specified limits.

Rational equations for an individual conductance or a resistance, such as that of a fluid boundary, contain a term involving physical constants, a physical-properties factor, always a function of temperature. The incompleteness of physical-properties data over the engineering range of interest from less than —100 F, to more than 3000 F, and the uncertainty of the temperature to be used, result in differences in evaluation which must be eliminated. We should have reliable figures for all of these physical properties, and all engineers should use the same figures, as is done with the steam tables.

FIRED CLASS OF HEAT-TRANSFER PROCESSES

For the fired class of heat-transfer processes, very little progress has been made in the direction of developing equations of rational form with empirical constants, valid within limits, especially in comparison with the extent to which success has resulted in the unfired class. This is a challenging situation because of the great practical importance of the fired class, concerned as it is with fuel utilization among other things.

The essential feature of the fired class, and that which distinguishes it basically from the unfired class, is the simultaneous generation of heat tending to raise temperature at the source, with heat transfer from the source tending to lower the source temperature. The source temperature is a resultant of generation and transfer, and cannot be used as a basis of calculating the heat-transfer rate or a conductance.

While there are such important subclasses of the fired heat-transfer class, as heat generation by friction or brakes, cutting tools, bearings, and the like, by electric resistance, arcs, or induction, and by any sort of exothermic chemical reaction, it would seem that priority might well be given to combustion in burners, furnaces, or in internal-combustion engines.

For this class of fuel-fired processes, the most promising approach seems to be the identification or discovery of the variables which control the thermal current at a receiving surface surrounding the source, that is, the furnace-absorption thermal current. The source is the flame of some surface area and volume, or the surface of a solid fuel bed radiating to the receiver, supplemented by the gaseous radiation of the stream of products of combustion and perhaps some convection. Some of these variables are noted as follows:

The size, shape, position, and emissivity of the flame in relation to the receiving or heat-absorbing surface.

The Btu per lb of products which, for given inlet temperature, determines the highest possible temperature of the flame source for zero heat loss, the adiabatic flame, or furnace temperature.

The temperature of the receiving surface, or of each of several parts, including furnace walls.

Experimentally, it is possible to measure the temperature of exit furnace-heat gases, and from this to calculate that part of the heat of combustion not absorbed but remaining as sensible heat of exit gases, the remainder being what was absorbed. However, accuracy of heat absorbed is not proved without a heat balance, by measurement of received heat.

Experience has indicated that, in a general way, the absorption thermal current, and the total hourly absorption in a function of the rate of heat generation available for absorption and that for a limited range of values of generation rates the relation is substantially linear for all furnaces, fuels, and firing means.

In a recent investigation of conditions in an aircraft gasoline-engine cylinder with high-frequency periodic combustion, this was found to be as true as for continuous combustion. The temperature of the metal wall at a point on a line normal to its combustion-chamber face varied in a linear way with the rate of heat released and available for absorption, Btu per hr for all values of speed, brake mean pressure, and horsepower.

Considering all of the varieties of fuel-fired equipment in use, and the fact that there is no reliable rational equation between heat absorption in furnaces and the variables which control it, it is significant that this sort of equipment has been steadily improved by designers and operators who have had to rely on empirical relations. Such empirical relations are reliable, however limited in scope they may be. This situation is an invitation to all concerned, especially the analysts, to undertake the job of rationalization of fuel-fired heat transfer that has progressed so much farther in the unfired classes.

CONCLUSION

Finally, in recognition of the importance of fact reporting, and exchange of information on all phases of heat transfer in industry, the recommendation is made that other engineering societies be invited to join in meetings sponsored by this Division, regularly and as frequently as practicable. Last year the chemical engineers were present, but there are other societies concerned, the electrical, the ceramic, and the metallurgical, for example. Naturally there should be close co-operation with other ASME Divisions on heat-transfer matters, such as the Power, the Oil and Gas Power, Fuels, Process Industries, Aviation, and perhaps some others.

EMPLOYER PRACTICE *Regarding* ENGINEERING GRADUATES

Supplemental Report[1]

This supplemental report includes some comparative analyses of the Report of EJC Committee on the 1946 Survey of the Engineering Profession, "The Engineering Profession in Transition." The report of the preliminary survey of the Committee on Employer Practice was published in "Mechanical Engineering," April, 1947.

THE purpose of the Engineers Joint Council subcommittee on Survey of Employer Practice Regarding Engineering Graduates was to learn directly from a representative group of industrial employers attitudes and policies in respect to the selection, training, placement, advancement, guidance, and professional activities of engineering graduate employees. A trial questionnaire was sent, in May, 1946, to 174 employers of engineers, including small and large organizations, covering a sample of the principal industries making a practice of employing engineering graduates, most of whom have had more or less well-defined courses of training and plans for advancement.

It was thought that this survey, which was a new one of its kind, would call attention to the methods of employers following the better plans for the benefit of those who either had no plan or had not perfected a plan to the best advantage of the engineering graduate and themselves, and that this objective would be a very important step in the right direction. A report[2] of this preliminary survey was published in the April, 1947, issues of the publications of the societies represented on EJC. That report included tabulated data received up to July 1, 1946, from 104 of the 174 employers.

The value of the data, as expressed by the many people who read the report, convinced the committee that it should include in a supplementary report several questionnaires received after July 1, 1946. A few additional questionnaires were submitted to a group of consulting engineers, and returns of a representative portion of that group as of May, 1946, are included in the present report.

The preliminary survey has thus been enlarged to include returns from 125 co-operators, with more than 2 million employees, among which are included a total of 38,000 engineering employees.

From these data Table 1 has been prepared. In this table individual industries are listed separately rather than by class groups, as was done in Table 1 of the preliminary report.

These industries have been arranged in order of the percentage of engineers to total employees, as shown in column 5, Table 1. Group A contains industries in which the engineers are more than 10 per cent of the total employees; group B, between 2 and 10 per cent; group C, between 1 and 2 per cent, inclusive; and group D, less than 1 per cent.

It will be noted (column 5, Table 1) that combining all of the companies reporting, the average ratio of engineering graduates to total employees is 1.9 per cent.

In order that the young engineer may see what opportunities lie ahead of him to become an executive in industry, columns 6, 7, and 8 (Table 1) have been prepared to show the number of all executives, and of engineers who are executives in the respective industries, and the percentages of all executives who are engineers, while columns 9, 10, and 11 show corresponding figures for officers in these industries. Columns 12 and 13 show the number of engineers for each engineering executive and each engineering officer, respectively, in the various industries. These two columns reveal that in companies in group D, where the number of engineers is the smallest percentage of the total employees, namely, 0.5 per cent (column 5), one out of every five engineers is an executive, and one out of every 23 is an officer of a company, while in group B, where the engineers constitute 4.6 per cent of the total employees (column 5), one out of every 35 engineers is an executive, and one out of every 120 is an officer.

Another important revision of the preliminary report of this committee is shown in columns 14 to 17 (Table 1) in which estimates of the number of engineers needed up to 1950 are listed. The preliminary report showed the need over the 4-year period to be about 31 per cent of the engineer employees in 1946, while this report, covering more companies, with the results obtained by weighted averages instead of averages of percentages, shows the need of 23 per cent over the same interval, or about 6 per cent per year. This is a lower figure than one given in the Compton Committee report,[3] which indicated an estimated need of 17 per cent per year. A second survey by the committee of the American Society for Engineering Education (formerly the Society for the Promotion of Engineering Education) has been made, but the data are not yet available.[4]

In view of the recent publication of the report of the EJC Committee on the 1946 Survey of the Engineering Profession by Andrew Fraser under the title, "The Engineering Profession

[1] This report was prepared by the EJC Subcommittee on Survey of Employer Practice Regarding Engineering Graduates, 25–33 West 39th St., New York 18, N. Y., which consists of the following: E. G. Bailey, chairman, William N. Carey (ASCE), Francis B. Foley (AIME), H. T. Woolson (ASME), R. C. Muir (AIEE), Lawrence W. Bass (AIChE), and Wm. F. Ryan (NSPE).

The survey was made by a subcommittee of the Engineers Joint Council's Committee on the Economic Status of the Engineer. The Committee is composed of representatives appointed by the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Institute of Chemical Engineers, and the National Society of Professional Engineers.

[2] "Employer Practice Regarding Engineering Graduates, Report of Preliminary Survey," MECHANICAL ENGINEERING, vol. 69, no. 4, April, 1947, pp. 306–308.

[3] "The Outlook in the Demands for and Supply of Engineering Graduates," *Journal of Engineering Education*, vol. 31, No. 7, September, 1946.

[4] For an interim report of the ASEE Committee on Manpower with estimates of supply of and demand for engineering graduates see *The Journal of Engineering Education*, vol. 38, no. 2, October, 1947, pp. 110–113.—EDITOR.

TABLE 1 SUMMARY OF SIGNIFICANT DATA OF EMPLOYER PRACTICE REGARDING ENGINEERING GRADUATES

(Revised to September, 1947, data as of May, 1946.)

Group	Code	Industry	Number of co-operators	Total employment	Total employees in those companies also reporting total engineers	Total engineers	Per cent engineers from Co. (3) & (4)	Total in executive capacity, department heads to chairmen of board, engineering executives; per cent engineering executives to total executives — Total	Engineers	Per cent	Total officers, engineering officers; per cent engineering officers to total officers — Total	Engineers	Per cent	No. of engineers for each engineering executive	No. of engineers for each engineering officer	Number of engineers, May, 1946, and estimated number needed by 1950 — 1946	1950	anticipated incr.	Per cent anticipated incr.
		Column no.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
A	T	Colleges	8	4,785	1,310	585	44.6	114	67	59	70	33	47	8.6	17.7	660	840	180	27
	U	Consultants	6	2,426	2,406	880	36.7	51③	45	88	38②	29	76	19.6	30.4	780	650	—130	—17
		Totals and averages	14	7,211	3,716	1,465	39.4	165	112	68	108	62	57	13.1	23.6	1,440	1,490	50	3
B	I	Instruments	7	17,854	17,854	1,081	6.1	159	82	51	35	18	52	13.2	60.0	1,081	1,182	101	9
	F	Electrical	9	263,600	263,600	13,515	5.0	344③	111	32	136	70	51	122.0	193.0	13,440②	16,627	3,187	24
	D	Chemical	7	81,570	81,570	3,408	4.2	276①	77	28	83	23	28	44.4	148.0	3,533①	4,849	1,316	37
	A	Aircraft	7	52,500	52,500	2,049	3.9	389①	113	29	66①	16	24	18.1	128.0	3,944	4,530	586	15
	R	Utilities	10	53,878	48,628	1,857	3.8	456②	214	47	125②	57	46	8.7	32.5	1,857	2,128	271	15
	M	Petroleum	6	78,200	78,200	2,886	3.7	323②	111	34	77①	23	30	26.0	125.0	550④	750	200	36
		Totals and averages	46	547,602	542,352	24,796	4.6	1,947	708	36	522	207	40	35.0	120.0	24,405	30,066	5,661	23
C	C	Building	1	1,500	1,500	30	2.0	22	9	41	8	3	38	3.3	10.0	30	40	10	33
	J	Machinery	14	96,184	96,184	1,836	1.9	888③	393	44	152②	71	47	4.7	26.0	2,214③	2,961	747	34
	L	Paper	4	12,525	5,025	89	1.8	60②	17	28	21①	2	10	5.2	44.5	17③	20	3	18
	H	Glass	2	20,700	20,700	315	1.5	130	68	52	26	11	42	4.6	28.6	315	400	85	27
	V	Communication	1	413,000	413,000	4,700	1.1	450	135	30	175	45	26	34.8	104.0	4,700	6,000	1,300	28
	E	Coal and coke	2	6,200	6,200	62	1.0	62	25	40	25	10	40	2.5	6.2	62	105	43	70
		Totals and averages	24	550,109	542,609	7,032	1.3	1,612	647	40	407	142	35	10.9	49.5	7,338	9,526	2,188	30
D	Q	Textiles	1	1,070	1,070	10	0.9	...①	.....		4	3	75	...	3.3	10	13	3	30
	P	Soap	2	11,275	11,275	95	0.8	150	30	20	14	0	0	3.2	...	95	95	0	0
	N	Rubber	4	165,914	105,914	750	0.7	635①	80	13	53	12	23	9.4	62.0	750①	831	81	11
	B	Automotive	5	318,000	98,000	550	0.6	402①	97	24	38①	9	24	5.7	61.0	500②	660	160	32
	O	Shipbuilding	2	4,300	4,300	27	0.6	35①	6	17	7①	2	28	4.5	13.5	15①	20	5	33
	K	Metals	18	242,583	232,583	1,296	0.6	1,115③	336	30	158③	53	34	3.8	24.5	1,269④	1,420	151	12
	S	Transportation	6	394,921	394,921	1,765	0.4	2,376	362	15	415	122	29	4.9	14.5	939③	1,125	186	20
	G	Food	3	83,800	83,800	216	0.3	122①	24	20	50	1	2	9.0	216.0	216	260	44	20
		Totals and averages	41	1,221,863	931,863	4,709	0.5	4,835	935	19	739	202	27	5.0	23.3	3,794	4,424	630	17
		Grand totals and averages	125	2,326,785	2,020,540	38,002	1.9	8,559	2,402	28	1,776	613	35	15.8	62.0	36,977	45,506	8,529	23

①②③④ Indicate number of co-operators not contributing specific data.

in Transition,"[5] it is interesting to compare some of the data contained in it with those which are included in the survey of this committee.

The first comparison will be found in Table 2 of this report. Here data from columns 1 and 4 of Table 1 of this report are compared with those presented in the "Distribution of Engineers Reporting Major and Minor Industry Fields," on page 87 of "The Engineering Profession in Transition." The outstanding results of this comparison are that the returns from 125 questionnaires direct from industry revealed that there were 38,000 engineers in the principal industries selected as a reasonable sample of those industries. The 1946 Survey of the Engineering Profession, in which questionnaires were sent individuals, lists 28,000 engineers (see Table 2, last column, of this report) in manufacturing industries. The survey of individuals includes in addition many engineers rendering personal services and engaged in construction work wherein special training courses are not usually given. Including all engineers in all classes of employment, the individual survey covers 36,855 persons.

In this connection it is interesting to note that according to the report, "The Engineering Profession in Transition" (page 94), the number of self-classified engineers in the United States in 1946 was estimated at 317,500. The report states (page 62) that 86,900 questionnaires were sent out on Aug. 28, 1946, to members of the engineering societies comprising those co-operating, as EJC and members of the National Society of Professional Engineers, duplicate names having been eliminated. Usable returns numbering 47,272 were received up to Nov. 18, 1946. The significance of these data is that the principal engineering societies have as members only 27.4 per cent of the engineers covered by the United States Census, although, presumably, a large number of the remaining 72.6 per cent should be eligible for membership.

It is evident from the foregoing comparisons of the two reports that a large number of engineers can be covered for certain purposes by surveys directed to industry. It is a question, however, whether industry can be depended upon to give

[5] For a condensed summary of this report see MECHANICAL ENGINEERING, vol. 69, no. 9, September, 1947, pp. 732–734. The complete report of 94 pages may be purchased through ASME Publication Sales Department.

TABLE 2 ENGINEERS IN INDUSTRY

(A comparison of those reported in two surveys made by Engineers Joint Council.)

	Employer Practice Regarding Engineering Graduates, sample survey, May, 1946 — No. of companies co-operating	Number of engineers	"The Engineering Profession in Transition," Aug.–Nov. 1946, p. 87, No. of engineers
Education, colleges	8	585	1,793
Consultants, independent	6	880	954 (1)
Consultants, employees private firms	...	...	1,579 (1)
Instruments	7	1,081	... (2)
Other manufacturing industries	...	...	1,041
Electrical equipment, mfrs.	9	13,515	3,471
Chemical, soap, etc.	9	3,503	2,408
Aircraft	7	2,049	1,125
Utilities, electrical and gas	10	1,857	3,527
Petroleum	6	2,886	1,230
Building products, cement, stone, glass	3	345	242
Machinery	14	1,836	1,820
Paper	4	89	248
Communications, telephone, telegraph, radio	1	4,700	1,554
Coal and coke	2	62	386
Other mining	...	...	1,867
Textiles	1	10	140
Rubber	4	750	351
Automotive	5	550	289
Shipbuilding	2	27	...
Other transportation and equipment	...	...	602
Metals, iron and steel and nonferrous	18	1,296	2,334
Transportation, Railroads	6	1,765	510
Food	3	216	388
Sub-total	125	38,002	27,859
Agriculture, forestry, and lumber	...	...	188
Printing and publishing	...	...	69
Construction, bridges, buildings, highways, sewerage, waterworks, etc.	...	...	6,807
Water and sanitary services	...	...	612
Personal services, refrigerating, ventilating, insurance, wholesale and retail trade, legal and others not specified	...	...	3,853
	125	38,002	39,288
Deduct for duplication of Consultants (1)	...	...	2,533
Net total	125	38,002	36,855

(1) Page 88.
(2) Not specifically listed, hence included in other manufacturers not specified.

the detailed information that was asked for in the individual questionnaires. The questionnaire directed to industry asked for limited information that seemed to be of greatest benefit to the contributing members of industry, as well as to their employees and other engineering graduates and engineering students.

Table 3 of this report compares the average starting salaries and approximate ranges of starting salaries offered to engineering graduates by industry, as covered by the survey of this committee in May, 1946, and the survey of the American Society for Engineering Education, together with "The Engineering Profession in Transition," salaries during the first year of employment. It is noted that the first two surveys show starting salaries of $207 and $210 per month, respectively, while

TABLE 3 ENGINEERS IN INDUSTRY

(A comparison of initial and early salaries as reported in three surveys made in 1946.)

	Ranges of starting salaries, $ per mo.	Average starting salary, $ per mos.
EJC Committee for Survey of Employer Practice Regarding Engineering Graduates as of May, 1946, largely bachelors	150–250	207
American Society for Engineering Education, "Compton Committee," May 1946, bachelors only	125–320	210

EJC Committee on the 1946 Survey of the Engineering Profession (Sept.–Oct., 1946)

	Lower 10%	Upper 10%	Median
"The Engineering Profession in Transition," under one year's employment (not starting salaries), p. 8, Table 1.2*a*	181	298	231
Engineers by professions, under one year, including all degrees (p. 17)	(1)	(1)	
Chemical	(200)	(340)	256
Civil	192	311	243
Electrical	(170)	(400)	237
Mechanical Industrial	178	286	225
Mining-Metallurgical	(150)	(320)	236
Other	(150)	(320)	224

Approximate increases in pay from Employer Practice reported by employers, May, 1946 (mostly bachelors)		"Engineering Profession in Transition," p. 8, Table 1.2*a*	
Start	$207	Under 1 yr.	$231
At end 6 mo.	224		
At end 12 mo.	237	Experience, 1 yr.	232
At end 18 mo.	257		
At end 24 mo.	267	Experience, 2 yr.	262

(1) Items in parentheses are near extremes from pp. 76, 77, and 78, and not lower and upper 10 per cent.

"The Engineering Profession in Transition" (page 8, Table 1.2*a*) shows a median first year salary of $231 per month. It should be remembered that "The Engineering Profession in Transition" covers conditions as of September and October, 1946, or about five months later than the report of the committee on Employer Practice. It covers those employed under one year, which included increases over starting salary. On the other hand, it is recognized that many companies reporting their starting salaries as of May, 1946, have later increased their salary scales.

On page 17 of "The Engineering Profession in Transition," salaries of those employed under one year are given for the various branches of the profession. These data are listed in Table 3 of this report without comparison, as the Employer Practice survey made no distinction with respect to the branches to which the engineers belonged.

The Employer Practice survey included some data covering the advances in payments from a small percentage of the co-operators. These are listed in Table 3, and are compared with those of "The Engineering Profession in Transition" (page 8) for experience under one year, for one year, and for two years, for all professions. This indicates a close agreement between the two surveys for experience at the end of one year and two years.

Table 4 of this report is simply a recapitulation of data in "The Engineering Profession in Transition" (page 24, Table 1.8*b*). It gives the "Percentage Distribution of the Engineer-

TABLE 4 DISTRIBUTION OF THE ENGINEERING PROFESSION BY OCCUPATIONAL STATUS AND GENERAL FIELD OF EMPLOYMENT, 1946, FROM EJC SURVEY, "THE ENGINEERING PROFESSION IN TRANSITION," (P. 24), PER CENT

Occupational status	Total	Chemical	Civil	Electrical	Mechanical, Industrial	Mining, Metallurgical
Teaching, college, university, and other	4.7	5.1	4.5	4.3	4.9	4.4
Consulting, independent	3.7	1.9	6.9	1.4	2.8	5.3
Consulting, private employee	4.3	2.7	3.9	5.6	4.7	4.5
Total Consulting	8.0	4.6	10.8	7.0	7.5	9.8
Administration, management, non-tech.	3.7	1.3	2.4	1.9	2.3	4.0
Administration, management, technical	31.3	32.2	31.5	28.3	30.6	40.2
Construction, supervision	4.8	0.7	13.3	3.6	1.9	0.7
Personnel, labor problems	0.2	0.2	...	0.1	0.2	0.1
Total Administration and Management	40.0	34.4	47.2	33.9	35.0	45.0
Design	15.4	10.7	20.1	18.0	18.7	0.3
Development	7.0	17.0	2.5	9.3	7.8	4.6
Analysis and testing	2.2	0.9	1.2	3.0	3.2	2.5
Drafting	1.1	0.2	2.0	0.8	1.7	0.1
Patents	0.3	0.4	...	0.3	0.3	0.6
Research, basic	0.6	0.7	0.5	0.4	0.7	1.4
Research, applied	6.0	13.8	2.2	4.9	5.4	14.6
Total Design, Research, and Development	32.6	43.7	28.5	36.7	37.8	24.1
Estimating	1.1	0.3	2.0	1.1	0.8	0.5
Inspection	0.9	0.2	1.2	1.0	0.8	0.9
Installation	0.6	0.1	0.2	1.4	0.7	...
Maintenance	2.0	0.5	2.0	2.8	2.5	0.2
Operation	2.5	3.1	0.9	3.5	1.9	6.0
Production	2.2	5.2	0.2	0.9	2.6	5.3
Safety engineering	0.3	0.1	0.2	0.2	0.2	0.6
Total Manufacturing and Production	9.6	9.5	6.7	10.9	9.5	13.5
Sales	4.4	2.3	1.5	6.5	4.8	2.4
Editing and writing	0.7	0.4	0.8	0.7	0.5	0.8
Total Sales, etc.	5.1	2.7	2.3	7.2	5.3	3.2
Total, per cent	100.0	100.0	100.0	100.0	100.0	100.0
Total engineers reported above	36,546[a]	3624	8601	9239	8708	2780
Number reporting as student, unemployed, retired, or other occupations not specified (not included in percentage and total)	1,089	48	266	217	196	75

[a] Includes 2429 other engineers and 1362 nonengineering, omitted from column analysis.

ing Profession, by Occupational Status and General Field of Employment, in 1946," or by professional groups, as recognized in the Founder Societies.

The occupational-status listings of the report have been regrouped to cover six main headings:

1 Teaching
2 Consulting
3 Administration and management
4 Design, research, and development
5 Manufacturing and production
6 Sales, etc.

These listings covered on the average 97.7 per cent of all the occupational listings. The 2.3 per cent not covered includes engineers reported as student, unemployed, retired, or in other occupations not specified.

It is interesting to note that the administration and management occupational status covers 40 per cent of those reporting, and in different professional groups varies from 33.9 per cent in electrical to 47.2 per cent in civil engineering. Next in importance is design, research, and development, which averages 32.6 per cent, and varies from 24.1 per cent in mining to 43.7 per cent in chemical engineering. Then comes manufacturing and production, with 9.6 per cent average, and varying from 6.7 per cent in civil to 13.5 per cent in mining engineering. Consulting, both independent and private employees, averages 8 per cent, and varies from 4.6 per cent in chemical to 10.8 per cent in civil engineering. Teaching averages 4.7 per cent, and runs uniformly in all branches of the profession, varying only from 4.3 to 5.1 per cent. Sales, averaging 5.1 per cent, varies from 2.3 per cent in civil to 7.2 per cent in electrical engineering.

It seems to this committee that this information constitutes a most valuable portion in the report of the 1946 Survey of the Engineering Profession. It should be of great interest to educational institutions as well as to management, as it indicates where engineering graduates are now being employed.

NOTE: The foregoing report was received by the Engineers Joint Council at a meeting held on November 17 and the committee was discharged. Appointment of another committee to continue studies in this field was authorized and is in process of organization.—EDITOR.

BRIEFING THE RECORD

Abstracts and Comments Based on Current Periodicals and Events

COMPILED AND EDITED BY J. J. JAKLITSCH, JR.

MATERIAL for these pages is assembled from numerous sources and aims to cover a broad range of subject matter. While few quotation marks are used, passages that are directly quoted are obvious from the context and credit to original sources is given.

Taxes and the Budget

FOR the last several years a nonpartisan nonprofit organization of American business leaders, called the Committee for Economic Development, has been conducting research in the nation's economic problems in order to develop the best way to reduce fluctuations in the national economy and to sustain high production and employment.

These men assign questions for study to qualified scholars drawn largely from leading universities and subject the resulting reports to a searching analysis in the light of their practical business experiences. In their final form the studies are made available to the public as CED statements on national policy.

The latest CED statement is one entitled "Taxes and the Budget; A Program for Prosperity in a Free Economy." It is an objective document which should make interesting reading for engineers. It is worthy, too, as a good example of clear statement on a confusing subject. Copies may be obtained free by writing to the Committee for Economic Development, 285 Madison Avenue, New York 17, N. Y.

The CED tax-reform program calls for two distinct steps: First, tax reductions in 1948 unless inflationary conditions make this unwise; second, subsequent reductions in federal taxes so that when war influences on the budget are ended, presumably in the early 1950's, the entire program can be put into effect. At that time, according to the Committee, the total annual tax take could probably be $15 billion below the yield of the present system.

On the basis of the present outlook for governmental receipts and expenditures in the calendar year beginning July 1, 1948, taxes could be reduced as much as $6 billion in the opinion of the Committee. The CED warns, however, that before making final decisions in regard to tax reduction in the near future we should have a clearer picture than we now have as to probable expenditures in the calendar year 1948 and should have evidence that inflationary pressures have begun to diminish.

Four goals underlie the Committee's budget policy: (1) Stability in the economy at high levels of employment; (2) restraint of unnecessary government spending and greater efficiency in government; (3) reduction of the public debt; and (4) minimum reliance on forecasting of economic fluctuations.

The Committee recommends a stabilizing budget policy as the best way to reach these goals. It believes that they cannot be achieved by a policy which attempts to balance the budget each year. It also rejects a policy that seeks to eliminate economic fluctuations by changing tax rates and expenditures to meet forecast changes in employment.

CED proposals eventually would cut revenue from excises by nearly 50 per cent or $4 billion. Elimination of excises on transportation and communication is recommended as a "first-step" cut because they enter into the prices of all goods, and the tax is therefore a heavy and disproportionate levy on low-income families. The report points out that the lowest-income group can share in tax relief only through removal of excises, since they do not now pay income tax.

As part of its long-range program the Committee also recommends the following:

1 A method for averaging income should be introduced for persons with widely fluctuating income.

2 The tax on intercorporate dividends and the penalty tax on filing consolidated returns should be eliminated. Their revenue yield is insignificant and they serve only to penalize many proper business arrangements.

3 Both corporate and noncorporate businesses should be allowed greater latitude in making annual allowances for depreciation.

4 In applying to operating companies the penalty tax against accumulation of profits to avoid individual income tax (Sec. 102 of the Internal Revenue Code), the burden of proving that accumulations are unreasonable should be on the Treasury.

5 The tax-free privilege on future issues of state and municipal bonds should be eliminated.

Cameras

Periscope Camera

A NEW type of periscope camera for the U. S. Submarine Service was disclosed recently by Eastman Kodak Company. It is stated that the new camera can take close-up beachhead pictures at a speed of better than one per second.

Kodak also reported that it has supplied the Navy's underseas force with a device by which a sheet of film from the new camera can be processed in daylight in less than 60 sec.

The company said that the first models of the new camera were delivered to the Navy late in World War II and were designed to get detailed views of Japanese shorelines and possible invasion spots.

The pictures it takes are about four inches square. They can be snapped in quick succession and pieced together to form a mosaic of a shoreline. This method often proves more suitable for beachhead planning than does the use of photos from fast-flying planes.

The rapid, "minute-method" of film development is possible when single-exposure sheets of film are used in the camera. The film is in a special case. When removed from the camera after exposure, the film case is dipped into fast-developing, washing, and fixing solutions. The resulting negative is immediately available for study by the submarine's captain.

Generally, though, the camera uses aerial film in 20-ft lengths. This permits 50 exposures. Standard development times are required.

A reflex viewing screen on the camera allows observation of almost the entire periscope field. The camera, although easily and quickly detachable from the periscope eyepiece, may be left in place even when it is not needed to take pictures.

Compact, moisture-tight, and rugged, the camera weighs 19½ lb and measures about 10 in. on a side. The f/6.3 lens (Kodak Ektar) is focused at infinity. Focal length is 127 mm. Shutter speeds range to 1/200 of a sec.

Television-Recording Camera

A 16-mm motion-picture camera for recording television programs on film also has been announced by Eastman Kodak Company.

The new camera, said to be the first of its kind, produces movies directly from the face of the monitoring "picture tube" in a television broadcasting station.

The camera takes pictures at the rate of 24 frames per second. Sound is recorded separately by standard methods.

The camera was developed in co-operation with the National Broadcasting Company studio at station WNBT and the Allen B. DuMont studio at station WABD.

The main uses of the new camera in television broadcasting will be: (1) To enable the recorded programs to be re-used by the sponsor for institutional public relations and advertising; (2) to record transmitted shows for billing requirements; and (3) to record all "live" programs that go out on the air. This use, for example, will be important for legal purposes.

Another possible major use, still in the experimental stage, is in a television "film network." The new camera photographs the "monitor tube" in the broadcasting studio. This tube shows everything that is transmitted, and is used by the station to keep constant supervision of the program.

If a film network proves feasible, the camera would photograph television programs by recording them as shown on the monitor tube. These film records of live programs then could be rebroadcast by stations in other cities. This would supplement the present limited and expensive television networks using coaxial cables and radio relays.

Directly televised programs are now limited in range to "line of sight" transmissions, or about 25 to 50 miles.

The basic design features of the camera include a 1200-ft film magazine that permits continuous recording of a half-hour program; separate synchronous-motor drives for the shutter and film-moving mechanisms; and a coated (Lumenized) f/1.6 lens of 2-in. focal length (Kodak Ektar).

The double-chamber magazine is a self-contained unit housing both the unexposed and the exposed film. It may be readily removed from the camera. Light locks allow changing loaded magazines in a lighted room.

Low-Temperature Research

RESEARCH laboratories generally can now undertake work at temperatures close to absolute zero as a result of the availability of the Collins Helium Cryostat, a relatively simple device which liquefies helium and can maintain any temperature down to 2 deg K, or —456 F. This device, now being produced by Arthur D. Little, Inc., Cambridge, Mass., is reported to be the first equipment to be regularly produced for maintaining such extremely low temperatures. Previously there have been only four helium-liquefying installations in North America; these were designed and built especially by the laboratories using them and required an expensive cascade system of refrigeration. The first of the Helium Cryostats went into use early in 1947 and there are now seven in operation in university, governmental, and industrial laboratories. Additional Cryostats are under construction. The engineering details of the Helium Cryostat were described for the first time by Allen Latham, Jr., member ASME, and Dr. H. O. McMahon, both of Arthur D. Little, Inc., in a paper presented before a meeting of the American Institute of Chemical Engineers, Detroit, Mich., recently.

FIG. 1 DR. O. MCMAHON WITH HELIUM CRYOSTAT

(Assembly includes helium supply and exhaust piping and the crosshead controlling valve timing for the expansion engines, which are located within the cabinet. As the helium expands, power is taken off through the flywheel and fed into the dynamotor at its right. Liquid helium or other liquefied gas can be drawn off through the vertical pipe at right, outside the cabinet.)

Low temperatures are essential for much research directed toward a better understanding of the properties of matter, since thermal motion of the molecules at higher temperatures masks the effects due to the laws of quantum mechanics. The true equilibrium state of many chemical reactions can be determined from thermodynamic constants which can in turn be computed from measurements made at low temperatures. Research at extremely low temperatures has been hampered by the fact that the scientist has been forced to devote much of his attention to the problem of reaching the low temperatures. With the availability of standard equipment for this purpose, the scientist's time will be released for research purposes.

The cold space of the Helium Cryostat and part of the refrigerating equipment is contained within a steel vacuum jacket 12 in. in diameter and about 5 ft tall, which is housed within a cabinet measuring about 3 ft × 2 ft. Other equipment includes a 10-hp compressor and a low-pressure gas holder. The complete unit weighs about 2800 lb and occupies less than 50 sq ft of floor space. Helium is the only refrigerant used. Liquid helium, or other liquefied gas, can be removed from the equipment.

The Cryostat is the invention of Dr. Samuel C. Collins of Massachusetts Institute of Technology. Its novel technical features include a heat exchanger which cools the compressed helium from room temperature to liquid-helium temperature and yet weighs only a few pounds, and a piston and cylinder expansion engine originally developed for use in oxygen generation. This engine uses a flexible connecting rod in tension, which aligns a specially hardened closely fitting piston within the cylinder and permits it to operate at extremely low temperatures without lubrication.

Arthur D. Little, Inc., has developed a design which incorporates these principles and can be operated by laboratory technicians, without attention by the scientific personnel. Among the features developed was a means for compressing the helium in ordinary lubricated compressors without contamination, and for storing it without contamination. Thus the helium is kept pure, and use of a clean-up system requiring a continuous supply of liquid air to freeze out the impurities is avoided. The Cryostats are constructed in small groups and at present the organization is able to supply additional Cryostats to laboratories needing them for research.

High-Alloy Foundry

THE American Brake Shoe Company has announced recently the opening of its new 3-million-dollar high-alloy foundry at Elyria, Ohio. It is said to combine the finest equipment, layout, and casting methods known to the high-alloy casting industry.

The plant has more than 150,000 sq ft of floor space. This includes a two-story office building; a two-story welfare building with lunch and washrooms; a fully-equipped dispensary; pattern shop and storage building; a building housing the heating plant; a machine-shop building; and the foundry itself, which measures 460 × 280 ft. All construction is of steel and brick with generous use of glass block throughout. The roof is monitor-type covered with precast concrete slabs.

It is stated that mechanization is as nearly complete as practicable in an alloy foundry producing miscellaneous sizes and shapes of castings. Sand-conditioning equipment is located in the center of the foundry. Conditioned sand moves overhead on a continuous-belt conveyer delivering to hoppers at 18 molding stations along the route to each end of the building. After the mechanical shakeout, the sand moves underground back to an elevator which carries it up to the conditioner again.

Equipment located in the molding department includes jolt rockover molding machines; jolt squeeze strip-molding machines; jolt squeeze molding machines for snap molds; floor jolt molding machines; and a sandslinger in the center of the foundry which is available for larger castings. Gravity roller-type conveyers are conveniently located to take molds away from molding machines.

Equipment in the core room includes bench jolt machines, core blowers, floor jolt machines for large cores, and a sand-conditioning unit separate from that for the molding department. Rack-type ovens and a car-type oven, all electronically controlled, handle core baking. Large cores are handled directly from the core department to the mold-setup floors.

Dust-laden air is removed by hoods over and under each shakeout, and delivered to five hydroclones where the air is thoroughly washed and returned to the shop. The sludge is deposited in two floor tanks from which it is removed regularly.

Nine power ventilators in the monitor roof remove smoke and gases from the melting furnaces and from the pouring floor. With this equipment, a complete change of air is effected every six minutes.

Three electric induction melting furnaces (200-lb, 1000-lb, and 2000-lb capacity top charge) and three top charge hydraulically controlled electric-arc melting furnaces (1000-lb, 3500-lb, and 10,000-lb) are located in the center of the foundry. These six furnaces supply metal to any point in the foundry with minimum time and travel. An automatic electrical installation controls the furnace operations.

An interesting technique is used in charging the furnaces. An orange-peel type of bucket loaded with the proper charge is lowered by a crane into the top of the hot furnace, the roof of which has been swung to one side about a pivot. Held closed by a knotted rope which burns away in a matter of seconds in furnace heat, the bucket door opens and the charge drops into the furnace. The furnace roof is then swung back into position, and a new melt is on. This technique is said to greatly speed up the charging operations.

The centrifugal-casting department has both vertical-axis and horizontal-axis casting machines. Vertical-axis castings up to 4 ft in diameter can be produced. The horizontal-axis equipment permits the production of castings up to 17 in. outside diameter × 12 ft long.

Necessary heat-treating, from stress relieving at low temperatures to quench-annealing of Chemalloy stainless castings at 2200 F, is handled in two electronically controlled furnaces. One is a large car-type and the other is a medium-size batch-type furnace. A quench tank at floor level is located between the two furnaces.

The finishing department has been laid out in such a way that castings move on practically a production-line schedule

FIG. 2 VIEW OF THE MELTING DEPARTMENT

(In the left foreground are three electric-arc furnaces. Behind them are three induction furnaces.)

FIG. 3 POURING A LARGE CASTING ON THE MAIN POURING FLOOR

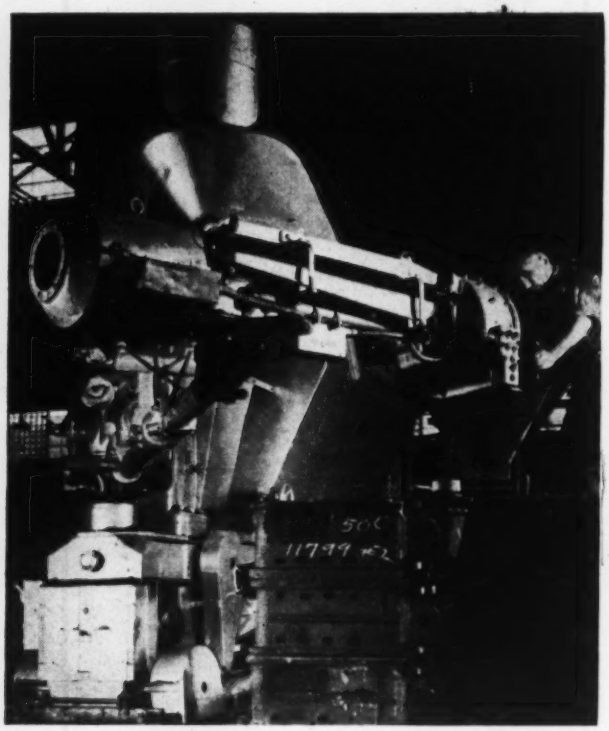


FIG. 4 RAMMING LARGE FLOOR MOLD WITH A SANDSLINGER

from the rough inspection and chipping, through to grinding and tumbling, rough-sandblast and preliminary inspection, x-ray rooms, welding and heat-treating, finish-sandblast, Zy-Glo test, and finally on to physical testing and inspection. Grinding is done in specially constructed booths.

Two complete dust-arrester systems serve swing-shaft, stiff-shaft, and bench grinding enclosed booths as well as tumbling mills and abrasive cut-off machines.

To facilitate inspection all castings are sandblasted at least once in one of two sandblast rooms, each served by its own dust collector.

Welding of castings is performed by three methods. These are electric arc, atomic hydrogen, and oxyacetylene. Large and intricate weldments are stress-relieved in an 8 ft × 15-ft car-type electronically controlled furnace.

All castings for certain specific operating conditions are subjected to thorough x-ray inspection. This includes muffles, pots, retorts, valves, and similar castings. Two industrial-type x-ray units, with capacities of 200,000 volts and 250,000 volts, are used to disclose internal defects such as shrinks, spongy metal, and blowholes, which would ordinarily pass other inspection tests. X-ray tests are conducted in two large rooms with huge lead and steel doors, concrete walls one foot thick, and steel rails over which transfer cars bring large castings directly to the x-ray units. X-ray negatives are developed, processed, and viewed in a modern complete darkroom. They are filed for reference and study in a large negative vault.

Microscopic surface fissures, invisible to the naked eye, are located by Zy-Glo equipment. This consists of a "black-light" unit which contains a lamp that emits near-ultraviolet light in the wave-length range between 3200 and 4000 angstrom units. The light, unseen by the human eye, is harmless to the eyes and skin.

In applying this test, a casting is first covered with a highly fluorescent penetrating oil, then washed with water, and dried and dusted with a powder which adheres to any traces of oil which may have penetrated into microscopic cracks. The casting is then inspected under the black-light lamp which causes the powder to glow. This reveals the length, width, and depth of any existing surface cracks. Cracks in castings are also revealed by subjecting the casting to pressure-testing by oil, air, or water.

The final inspection department and shipping platform is so arranged that castings can be loaded direct either on freight cars or trucks at platform level.

The machine shop is equipped to handle practically all the necessary machining operations on heat-, abrasion-, and corrosion-resistant castings produced at this foundry. The machining of highly alloyed castings is generally more difficult than machining of carbon-steel castings. For this reason it has been found more economical to have all the machining done before castings are shipped.

All production will now be concentrated at Elyria. It is stated that when in full production, this foundry will double the previous heat- and corrosion-resistant alloy production of the company.

Low-Grade Ores

ACCORDING to the *Industrial Bulletin* of Arthur D. Little, Inc., the present rate of depletion of this country's reserves of high- or medium-grade ores requires increasing use of low-grade ores for most metals and some nonmetals. It is stated that because these ores cannot be used or refined directly, some of the waste must be removed near the mine by purification processes generically called "beneficiation." The term "mineral engineering" has recently been adopted by several interested groups to describe these processes, which yield a product with an increased percentage of the desired material.

Beneficiation, or mineral engineering, is beginning to be necessary for Lake Superior iron ores, which are handled in tremendous volume. As it becomes more common, a large investment, transforming the mining region into a manufacturing area, is expected.

In 1946, about 12 million tons of iron ore, or 23 per cent of the Minnesota ore shipments, consisted of concentrates from inferior ores, and it is expected that this year such shipments will approach 20 million tons. Several companies have recently announced plans to construct large-scale beneficiation plants in the Lake Superior iron-ore region. The sums eventually needed for construction of such facilities in this region may well total over 500 million dollars.

The operations used to concentrate ores include crushing to obtain minerals and waste in separate particles, screening, washing, leaching, classifying by particle size, filtering, sintering, magnetic separation, and flotation to separate desired from undesired particles. The latter is the most commonly used process, with more than 150 million tons of crudes separated by this method annually. In flotation, the finely crushed ore is treated with chemicals which preferentially coat the surface of one or more of the mineral constituents of the ore and make these constituents seek the air-water boundary. The minerals are gathered in a froth on top of the water, while the other constituents remain suspended in the water. Up to now the largest field, on a tonnage basis, for froth flotation has been in the concentration of the sulphide ores of the base metals, with perhaps the largest single application concerned with recovering copper, which may constitute only one half to two per cent of the mined ore. Froth flotation is becoming increasingly important in treating nonmetallic crudes, such as cement rock, phosphates, potash salts, clays, and glass-sands, but the reagents are relatively expensive. Its use for cleaning coal has been quite extensive in Europe, but has been adopted only on a limited scale in this country. As the price of coal rises, however, consumer standards will go up, and insistence on slate-free coal will promote more cleaning. With increased mechanization of mining, there is a tendency to mine carelessly and clean carefully afterward.

Rapidly gaining headway as a cheap method of concentrating some types of ores is said to be a process known as the heavy-media, or sink-float method. In this process, heavy-gravity solids such as ferrosilicon, magnetite, or galena are ground so finely that when they are mixed with water they create a "medium" which, when gently agitated, behaves like a fluid, but is much heavier than water. The ore to be treated is coarsely crushed, with some of the resultant particles primarily waste and others containing primarily the desired material. When the coarsely crushed ore is introduced into the heavy medium, the waste will float and the valuable portion will sink, or vice versa, depending on the particular nature of the ore being treated. The concentrate and the waste can then be separated from the medium, and for nonferrous ores the concentrate is reground to much finer sizes for froth flotation. The disadvantage of this process is the inability to produce a high-grade concentrate from fine ore. At the present time, the heavy-media method is used to some extent on lead and zinc ores in Idaho, the Oklahoma-Missouri-Kansas area, and on Bolivian tin ores. A pilot plant using the method is operating on Lake iron ores.

The greatest single field opening up for mineral engineering is reported to be in the concentration of iron ores, especially in the Lake region. At present, most treatment of Lake ores consists in crushing, screening, washing, and classifying, which is a separation according to relative sizes and densities. The discharge from the classifier overflow constitutes the tailings, which are usually thrown away. Because the iron ore is hard and dense, and the waste material is soft, separation is simple, but a considerable amount of fine iron-ore particles is lost in with the tailings. The possibility of recovering this ore is limited by the low value of iron ore, which will not support much beneficiation. Several plants, however, operate on material from old mine dumps containing residues from the time when much higher-grade ores were used. Magnetic concentration and roasting or sintering to agglomerate the fine dust into larger particles require a cheap fuel source.

All-Carbon Hearths

BIG cups of hard-baked carbon, each weighing 579,000 lb, form the hearths of two new blast furnaces which Carnegie-Illinois Steel Corporation is building at its South Chicago Works, and another which has recently been rebuilt and blown in at Gary, Ind. All three furnaces will meet new, ultramodern specifications of the United States Steel Corporation and soon each will be producing more than 1500 tons of iron per day for use in the manufacture of steel.

The carbon hearth was specified because carbon is not adversely affected by temperatures ranging from 2700 to 3000 F common to the smelting of iron. Moreover, carbon expands less than most materials under great heat and is impervious to molten iron and slag. The standard hearth, which is built of big carbon blocks, is 33 ft 6 in. in outside diameter. Its carbon bottom is 3 ft 9 in. thick and the vertical sides, 2 ft 3 in. thick, rise 9 ft 4 in. to form the cup in which molten iron and slag will be collected.

Beneath the carbon hearth of each of these big furnaces is a still larger foundation cup of concrete, 58 ft in diameter and 20 ft high, extending $11\frac{1}{2}$ ft below and $8\frac{1}{2}$ ft above ground level. Between the carbon and the concrete cups are seven courses of high-quality refractory brick, totaling $10\frac{1}{2}$ ft in thickness, as well as 2 ft 3 in. of second-quality brick.

The body or "stack" of each of the three furnaces, as of practically all blast furnaces, is shaped roughly like the chimney of an old-fashioned kerosene lamp. But these stacks are 108 ft high—a total of 205 ft when charging and other overhead equipment is counted. Where a lamp chimney is glass, these are built of brick, 3 ft $4\frac{1}{2}$ in. thick for most of the height, enclosed in a welded steel shell. At the bulge above the hearth,

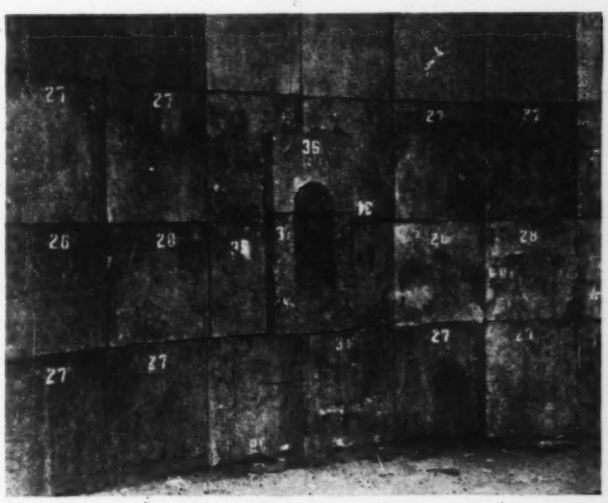


FIG. 5 VIEW OF COMPLETED SIDE WALL OF ONE OF THE CARBON-BLOCK-HEARTH BLAST FURNACES

where the heat is most intense, the brickwork is reduced to 2 ft 3 in. thick but is water-cooled. Unlike a lamp chimney, the blast-furnace stacks are closed at the bottom, in this case by the carbon hearths, whose inside diameter approximates the width of a three-lane road.

For the three furnaces carbon blocks 22½ in. thick, 30 in. wide, and up to 15 ft long for the hearth bottoms, and smaller blocks for the walls, were specified. These blocks were ordered made of a mixture of sized petroleum coke and low-ash anthracite which had been heated to drive off volatile matter. Mixed with pitch, they were extruded by a hydraulic press at 2000 psi, then baked in sealed ovens at temperatures of 1800 to 2000 F for periods up to seven weeks.

The new carbon hearths are said to represent the last word in hearth construction. Although they cost considerably more than hearths made of brick, they are considered worth the difference. They are also reported to give greater protection to the men who operate the furnaces and to increase the quantity of iron that can be obtained from a furnace without interruption for repairs.

Overfire Jets

TO provide commercial and industrial plants with an improved guide on how to design, construct, and install overfire jets for smoke prevention, Bituminous Coal Research, Inc., has published a revised and enlarged issue of Technical Report VII, "Application of Overfire Jets to Prevent Smoke From Stationary Plants."

The publication, written by Richard B. Engdahl, member ASME, assistant supervisor, Battelle Memorial Institute, and William S. Major, member ASME, development engineer, Bituminous Coal Research, Inc., covers the cause of smoke and just how the jet functions to keep smoke formation to a minimum. All example studies are coupled with drawings showing furnace views before and after overfire-jet application. Drawings have also been added to show construction details of popular sizes of steam-air jets built from standard pipe and fittings.

A feature of the new publication is the inclusion of "Work Sheets" for use in designing either steam- or blower-actuated jets for any type of boiler furnace. These work sheets carry systematic reference to the simplified graphs, tables, and formulas that are used in determining air-tube size, tube spacing, number of tubes, nozzle size, and the like.

Copies of this booklet are available on request from the Technical Information Service, Bituminous Coal Research, Inc., 912 Oliver Building, Pittsburgh 22, Pa.

Aircraft-Carrier Research

A THIRTY-FIVE-foot aluminum model of an aircraft carrier of the Essex class has arrived at Stevens Institute of Technology, Hoboken, N. J., and has been installed in the newly constructed 40-ft testing tank of the Damage Control Research Laboratory, it was announced recently. Stability tests and studies in which this and a smaller 20-ft wooden model will be used are being carried on under contract with the Office of Naval Research, Special Devices Division, and in cooperation with the Bureau of Ships.

The aluminum model is built 1/24 actual size and weighs almost 9000 lb. It is constructed with compartments which can be flooded to simulate any flooding conditions which might occur when an aircraft carrier is damaged at sea.

FIG. 6 ALUMINUM SCALE MODEL OF AIRCRAFT CARRIER

The wooden hull, built to an exceptionally high degree of accuracy, and a very sensitive inclining device, will make it possible to obtain exceedingly accurate experimental determinations of intact stability.

Use of the two models will greatly facilitate experimental work in determining values on which stability data can be based. Both ship models will be tested in the new tank which was completed last summer. The tank itself is 40 ft long, 7 ft wide, and 4 ft deep.

Damage-control research for the U. S. Navy was undertaken at Stevens when kamikaze attacks were causing great damage to American ships in the Pacific, especially to aircraft carriers. The importance of knowing after a ship is damaged exactly how stable she is, when it is safe to continue fighting her, and at what moment it becomes necessary to abandon ship was highlighted by these attacks.

Reports From Germany

Magnesium Die Casting

MAGNESIUM die-casting techniques used by the Mahle Co., Bad Cannstatt, Germany, are discussed in a report (PB-1251) now on sale by the Office of Technical Services, Department of Commerce, Washington 25, D. C. It is believed that Mahle techniques may be of interest to American industry in the development of new and wider uses of magnesium parts in the automotive and other fields.

All magnesium parts at the Mahle firm are cast in hot-chamber die-casting machines. Small castings up to one-pound sizes are made on piston machines and larger ones up to 13 lb on compressed-air machines. Mahle officials believe that no significant improvements in density and strength of castings result from extremely high-pressure operation as compared with hot-chamber machine castings. They also believe their hot-chamber method to be more economical.

One of the firms officials said that the development of cold-chamber machines with their required high pressures is in the wrong direction and can lead only to larger more expensive installations without securing compensating advantages. He thinks that while there may be a qualitative difference between castings made at low pressures of a few atmospheres and those made at 80 atm, there is no significant difference in the soundness of castings made at hot-chamber pressures of 80 atm and those made at cold-chamber pressures of 200 atm or higher.

Concerning the choice of piston versus air-pressure operation, the official states that it will probably be easier to overcome the difficulties inherent in piston operation by developing new de-

signs and wear-resistant materials than to attempt to remove the more fundamental shortcomings of air-pressure operation.

Some of the most critical factors in the successful operation of Mahle piston machines relate to the material and the handling of the piston and cylinder, the report states. The piston and the inset lining for the cylinder wall and dies are of tungsten steel, specially heat-treated. The piston is cleaned daily by withdrawing it from the pot and wire-brushing it, or sanding it with emery by hand. The cylinder is cleaned weekly. Also, after a week of operation the piston may need refitting; if so, it is cleaned and reground.

The number of castings made per hour by the Mahle firm depends on the size of the castings. One large casting, an aircraft landing-wheel section 15 in. in diameter with a 4-in. cross dimension, is made at the rate of 40 per hour. Smaller parts on the order of 2-in. dimensions are made at a rate of 100 to 400 per hour. The firm made about 1800 tons of magnesium castings in 1944.

Gas-Turbine Blades

Three methods used by one German company to fabricate gas-turbine blades are described and illustrated in a report (PB-81642) on sale by the Office of Technical Services. The report is based on a visit to the Bavarian Motor Works at Munich.

The BMW produced gas-turbine blades by machine-turning a piece of steel bar; by deep-drawing from a disk of steel; and by cold-forming and welding. Production costs of the three methods are compared but no attempt is made to compare performance qualities.

The steel used is an austenitic chromium-manganese alloy steel made by an Austrian mill. Four stages in the machine turning of the turbine blade from bar steel are illustrated. Several drawings also illustrate the deep-drawing operation, and cold-forming and welding.

The report gives directions for making a special lubricant from cornstarch, soap, graphite, and waterglass, which made it possible to dispense with expensive pickling and copperplating procedure prior to each drawing. Formerly, the blades had to be pickled and copperplated before being drawn, then deplated before being annealed, and replated before the next draw. In using the lubricant the metal is coated prior to the drawing operation and the coating dissolved with hot water after drawing and prior to annealing.

Mold and Core Making

A unique method for making sand molds and cores for precision casting of various metals, developed by Croning & Co., Hamburg, Germany, may be an important advance in the art of metal founding, according to a report (PB-81284) on sale by the Office of Technical Services.

The process appears to be especially important for casting small pipe fittings in steel, hitherto cast in malleable iron only.

Called the "C" process, the method uses a molding material consisting of a dry mixture of high-grade silica sand and a plastic binder in powdered form.

The procedure for making molds from the material is simple, the report states. The half pattern, gate, and runner are permanently fixed on a metal plate. A set of beveled bosses and corresponding cavities are machined on the pattern plates and these shapes, when transferred to the mold halves, serve as positioners to insure exact matching.

The pattern unit is heated to about 200 C and sprayed with a paraffin solution which provides a uniform oily film. The plate is next clamped, pattern downward, over a box containing the molding material. Then the assembly is quickly inverted. The molding material falls and covers the surface of the hot metal, softens, adjusts itself to the shape of the pattern and plate, and forms a continuous coating over the entire surface. The coating builds up to 3 to 4 mm thickness in about 6 sec.

The pattern plate with the adhering coating is then placed in an oven at 300 C for 2 or 3 min, resulting in the conversion of the resinous material to a hard, insoluble, bakelite-type plastic which bonds the sand grains together. The half mold is a thin shell with enough strength and stiffness for the casting operation. Cores are made in much the same manner.

In casting, liquid metal is poured into the mold in the conventional manner. The metal is easily removed from the mold as no burning on or sticking of sand to the casting surface occurs. Cores can be removed by lightly tapping the casting.

Castings of iron, steel, and aluminum made by this method were examined in as-cast condition and were found to have unusually smooth and clean surfaces. The fin around the parting line was very thin and could be easily removed. Shot-blasting was unnecessary. The smallest casting examined was a signet ring which showed remarkably minute detail. The heaviest was a 6 to 8-lb pipe fitting with cast threads. The manager of the plant stated he had made valve housings in straight carbon, vanadium, and manganese steel with 2.5-mm wall thicknesses.

Centrifugal Compressors

Though no significant advances have been made in recent years in German centrifugal-compressor manufacture, some construction details differ from American practices and are of interest, according to a report (PB-80358) on sale by the Office of Technical Services.

The report reviews German design practices and construction methods for centrifugal gas compressors as observed at various German firms.

The Germans place special emphasis on methods for cooling the gas. The work of compression, from a fixed suction pressure to a certain end pressure, becomes smaller as an isothermal process of compression is approached, the report states. It is practically impossible to reach the isothermal cycle of compression but two distinct cooling methods for approaching this cycle, one involving cooling the gas in the passages inside the compressor and the other, cooling chambers outside the compressor, are in use in Germany, according to the report.

With the internal method, the air is cooled inside the compressor in the passages formed by the diffuser and return channel limiting the amount of cooling surface available. As the peripheral impeller velocities increase and more compression work is done per stage, the cooling surface inside the compressor becomes insufficient.

Most German compressors are built for external cooling. One firm uses three cooling chambers for its nine-stage compressor. The arrangement of the cooling chambers permits the cleaning of the water or air side of the cooling surfaces without disturbing any of the structural members of the compressor.

In the Brown-Boveri "Isotherm" compressor, the gas is cooled after every stage except the first. The finned-tube bundles are housed in two separate chambers on the sides of the compressor. The water side of the tubes may be cleaned during operation. To clean the gas side, the whole chamber has to be disconnected from the compressor body. The Brown-Boveri method of cooling the gas after every stage is said to be the closest approach to the ideal isothermal process of any of the constructions used by the German manufacturers. The construction is costly, but since many of these compressors are in opera-

tion continuously, the power savings derived from the close approach to the isothermal cycle of compression may outweigh the higher capital investment.

Hydraulic design, compressor regulation, structural design of compressors, and design trends, are also discussed in the report. The outstanding trend is reported to be the increase in impeller speed which causes a decrease in weight for equal capacities and compression rates.

Synthetic-Spinel Jewels

Synthetic spinel which can be hardened by heating is as satisfactory for bearing-jewel use as synthetic ruby or colorless synthetic sapphire and costs less to produce, according to a German research report (PB-78652) on sale by the Office of Technical Services.

Lower hardness of synthetic spinel before heating makes it possible to manufacture bearing jewels in half the time it takes to make them from synthetic corundum and reduces the amount of diamond bort needed for finishing work by 70 per cent, the report states.

Research on the theoretical and practical possibilities of hardening synthetic spinel revealed that it is necessary to start from a base material containing a considerable excess of aluminum oxide in order to obtain monocrystalline spinel boules which will not crack in the manufacturing process or while being cooled. The excess of aluminum oxide acts as a crystallizer in the synthesis of spinel.

Tests on the mechanical properties of hardened synthetic spinel, a magnesium aluminate of the composition $(MgO)_3 \cdot (Al_2O_3)_5$ as compared to synthetic corundum proved that its mechanical corrosion hardness attains 51 per cent of that of corundum, its Vickers hardness 73 per cent, and its shearing strength 131 per cent. The vibration test proved that its increased resistance is sufficient to warrant its use for bearings in place of corundum.

Any change in the composition of the spinel will give different properties, according to the report. The strength is lowered when the alumina content is lowered and is increased if the proportion of alumina is increased.

The report states that spinel bearings gave perfectly satisfactory results when used in instruments and caused no complaints.

Worm-Gear Testing Machine

A UNIVERSAL worm-gear testing machine announced recently by The David Brown Tool Company, Huddersfield, England, is reported to provide an accurate yet rapid means of checking all dimensions upon which the performance and interchangeability of a worm depends, and for testing finished wheels in conjunction with a master worm, thus providing a rapid check to be made on the accuracy of the tooth contact. It is also said to provide a convenient means of meshing together individual pairs of worm gears for the purpose of these tests where the quantities involved do not warrant the expense of a master worm.

An auxiliary slide, which will accommodate the various worm testing instruments, all of which can be adapted without disturbing the headstock centers on the main bed, is also provided.

The machine checks the following: Concentricity of the worm, thickness of worm thread, pressure angle of worm thread, pitch and indexing of worm threads, thickness of worm-wheel teeth, and contact area on the worm-wheel teeth.

The bed embodies three horizontal slideways, two of which

FIG. 7 UNIVERSAL WORM AND WHEEL TESTING MACHINE SHOWING A WORM GEAR BEING TESTED FOR PRESSURE ANGLE

are parallel to each other and the third at right angles to them. The main slide carries a pair of headstock centers for supporting the worm, and the one at right angles to it bears against an adjustable arbor adapter on which the worm wheel is mounted. The bed, supported by three-point suspensions, is securely bolted to a rigid welded-steel cabinet of box section which provides ample cupboard accommodation for the accessories. One headstock center has handwheels for fine adjustment. The headstocks themselves can be locked on the slide in any position to suit the length and design of worm shaft.

The slide which carries the worm-wheel arbor is controlled by a traverse screw passing right across the bed of the machine, the screw being provided with two operating handwheels, one at either end, each having a graduated dial which, in conjunction with a vernier scale, enables the setting to be measured to 0.001 in. or 0.01 mm.

A micrometer sleeve—screwed on its outside diameter—is fitted into the slide so that it is free to move in a vertical direction, but is prevented by a sliding key from rotating. Vertical adjustment of approximately one inch is effected by rotation of a handwheel integral with a steel nut, which engages the screwed portion of the arbor sleeve. By means of a graduated dial, the setting can be measured to 0.001 in. or 0.01 mm.

Welding Jet Engines

AT the 1947 autumn meeting of the Institute of Welding held at Olympia, London, W. 14, England, a paper, "Welding in the Development of Jet-Propulsion Engines," was read by H. E. Lardge, and is reported in *Engineering*, October 17, 1947.

According to Mr. Lardge, the welding engineer was primarily concerned with the combustion and exhaust systems which were made almost entirely of sheet metal. These systems had to operate at high temperatures, which gave rise to considerable thermal stress. Alternating stresses, which were caused by pulsations of varying frequencies and magnitude in the air stream, were also present. Moreover, the need for plant interchangeability made it imperative that close manufacturing tolerances be observed. All these factors influenced the choice and operation of the processes used. From a welding standpoint the question of materials was important. Inconel was first used for the parts exposed to the highest temperatures, such as the flame tube, but finally a nickel-chromium alloy in sheet form, known as Nimonic 75, was adopted. For components

such as the exhaust unit and jet pipe, austenitic stainless steel of the weld decay-free variety was employed, while mild steel protected from corrosion by spraying with aluminum had been found satisfactory for the outer casings of the combustion chambers where there was no direct contact with the hot gases. The high yield point and high ultimate tensile strength at room temperature of Nimonic 75, together with its high rate of work-hardening, added to the difficulty of producing parts by spinning, pressing, or deep drawing. Annealing naturally produced surface oxide film, which had to be removed before welding. The mechanical design of the engines was such that solid flanges attached to the sheet-metal parts by welding had to be provided for purposes of mechanical strength and rigidity. These flanges being exposed to the hot gases, had to be of heat-resistant material. They were therefore machined from centrifugally cast cylinders of austenitic stainless steel containing a fairly high percentage of tungsten.

For fabricating purposes, the carbon arc was chosen where fusion welding had to be used on the main assemblies as the heat was localized and distortion was therefore likely to be a minimum. The nature of the work was also such that a short easily controlled electrode was required and this requirement was fulfilled by the carbon arc. Oxyacetylene welding was used to a limited extent, although distortion was a problem, but the metallic-arc process was not considered suitable for the relatively thin gages employed. Some experimental work had been done with the hydrogen torch and flash butt welding had many attractions, although some development work was needed before it could be adopted generally for this class of work. Of the resistance-welding processes, spot, stitch, and roller seam welding were found to be the most suitable. The last had been most exploited, as it was consistent, speedy, and convenient. Stitch welding lent itself readily to the welding of irregular shapes, or interrupted straight weld runs where seam welding could not be employed. Spot welding was used most frequently for tacking purposes prior to stitch or seam welding, though there were many instances where it could take structural loads alone or in association with silver-alloy brazing. Silver-alloy brazing with the oxy-coal-gas torch for mild-steel and stainless-steel parts was used to a considerable extent. Another useful process for assembling mild-steel parts was copper brazing carried out in a large continuous conveyer furnace with controlled atmosphere. This furnace was installed primarily for the "clean" interstage annealing of pressings in stainless steel and Nimonic 75, but it had also proved successful in annealing-welding sheet-metal structures in the heat-resistant alloys.

Photographic Memory

A PHOTOGRAPHIC "memory" for use by the U. S. Navy is being developed by Eastman Kodak Company, it was announced recently.

Reports indicate that when completed, the memory will be able to "read" and "memorize" mathematical data at a speed of a thousand numbers of 12 digits each every second.

The device will be part of an electronic computer being developed by the Massachusetts Institute of Technology, Cambridge, Mass. Supervision of the calculator and memory projects is under the Special Devices Center of the Office of Naval Research, Sands Point, Port Washington, L. I., N. Y.

Key to the memory is the use of spots. They are clear and opaque rectangles, about 0.01 in. square, recorded on strips of film.

The electronic calculator will control and present information in the form of spots of light on the face of a cathode-ray tube. This tube resembles the viewing tube of a television receiver. A special camera, meanwhile, will photograph each pattern of spots as it is produced by the moving electronic beam within the tube. Thus the numbers are permanently recorded.

The memory will move the developed film through an optical system. This will project the recorded data on to photo-electric tubes. These tubes in turn will supply electric signals —corresponding to the numbers on the film—to the calculator.

The memory is expected to offer the advantages of compact lasting "storage" for limitless quantities of numbers. At the same time it will operate at the swift pace demanded by an electronic calculating machine.

As an example of the memory's capacity, a company scientist pointed out that a 100-ft strip of 35-mm film will hold about 3,000,000 spots representing digits.

For auxiliary use the company will build an apparatus to convert automatically the information recorded on film into tables of numbers and graphs suitable for direct studying.

Rapid, automatic, film-processing machines will make the recorded material almost immediately available for re-use by the calculating apparatus or for projection and examination by mathematicians.

British Coal Production

A BRITISH Information Services report indicates that Great Britain expects to attain her 1947 coal target of 200 million long tons, because better tools and longer hours have resulted in rising coal production.

Several times during the year, output has soared over the weekly target of 4 million long tons. Second only to the British mines' call for men is the miners' call for steel—to build the equipment which will result in a maximum tonnage of coal at the surface. It is said to be on the way.

One hundred mechanization projects introduced in 1947 have resulted in an increase of 60 per cent in output for man shift in pits where they have been installed. In the first half of 1947, 1000 mechanical conveyers, 470 coal cutters, 81 Diesel locomotives, and 4 million feet of conveyer belting were sent to the pits, and further orders totaling more than $38 million have been placed for delivery before the end of the year. Britain plans to spend in all $600 million on boosting coal production.

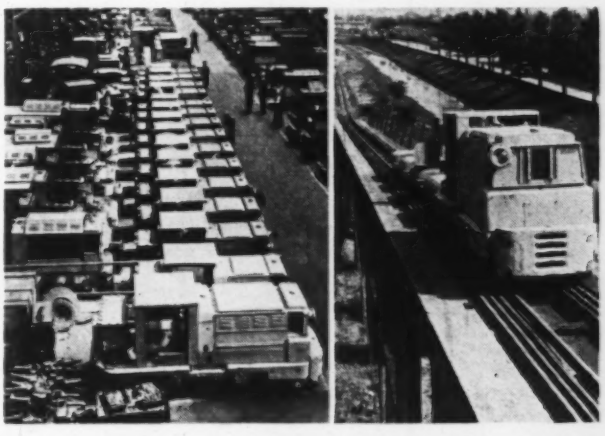


FIG. 8 BRITISH DIESEL LOCOMOTIVES (*left*) FOR MAIN HAULAGE WAYS COME OFF ASSEMBLY LINE

(Their exhaust systems are made flameproof and harmful fumes are not released into the pit. New mine locomotive (*right*) is tried out on test track. The locomotives have to work over heavy gradients in the pits.)

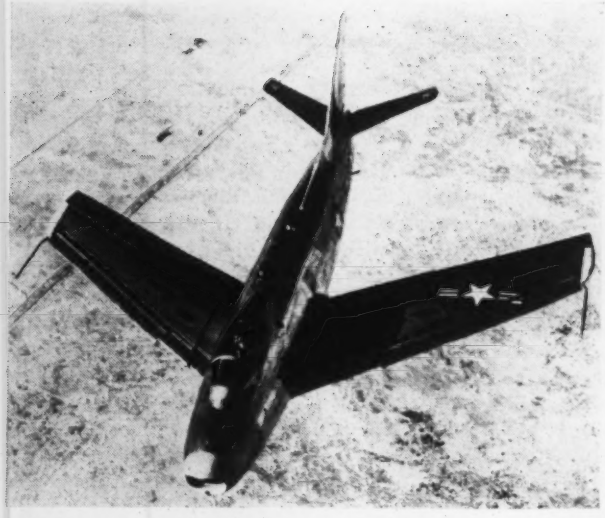


FIG. 9 JET FIGHTER AIRPLANE WITH SWEPT-BACK WINGS

Jet Fighter Airplane

THE United States Air Force's first swept-back jet fighter airplane, the North American XP-86, has successfully completed its initial test flights at Muroc Air Base, Calif.

The single-place low-wing fighter, which employs a sweepback in its wings and tail assembly, has completed approximately 30 flights and has amassed a total of about 30-hr flying time. Pilots, Air Force observers, and company engineers declared the initial flights highly satisfactory.

Designed to attain speeds in excess of 600 mph, the XP-86 is the first operational fighter with swept-back wings to fly in this country. The sweepback which delays compressibility shock waves enables the airplane to reach speeds higher than those possible with the conventional wing. Sweepback angle of the XP-86 is 35 deg for both wing and tail assembly.

Powered by a GE-Allison J-35 axial-flow jet engine capable of producing 4000 lb of thrust, the XP-86 employs the single straight ram duct, with its opening in the nose.

The XP-86 has a wing span of 37 ft, a length of 37 ft, and a height of 14 ft. It has a range of more than 1000 miles and a service ceiling of more than 40,000 ft.

The plane is equipped with a pressurized cabin and a pilot-ejection seat. The landing gear is the conventional tricycle type with a steerable nose wheel.

Aluminum Ships

THE application and use of aluminum alloys in ship construction was discussed by M. G. Forrest, senior assistant naval architect, Gibbs & Cox, Inc., New York, N. Y., in a paper presented at the annual meeting of The Society of Naval Architects and Marine Engineers, in New York recently.

Mr. Forrest stated that one justification for the use of aluminum in place of steel would be, in special cases, the ability of the metal to resist corrosion caused by special liquids. Also, although the metal itself is less corrosive than steel when subjected to marine exposure, the extent of the gain due to this factor cannot be ascertained until vessels are built and in service for some years. The basis for the design is generally the application of the same thickness-corrosion factors for aluminum as for steel.

The primary justification at the moment for the use of aluminum in place of steel is the saving in weight that can be obtained. This in turn will be reflected usually in an increased dead-weight carrying capacity, an offsetting item to be considered when evaluating the higher initial cost of the base metal and the higher fabrication cost.

It is found that the proportions of aluminum vessels will follow, in general, those of steel vessels except that wherever possible an increase in the depth-to-beam ratio and a decrease in the length-to-depth ratio are advisable.

More than the usual particular attention must be paid to details, so that extremes are avoided which would require unusual scantlings beyond the rolling and extrusion limits of aluminum.

In the layout of the form, every reasonable attempt must be made to keep the number of furnaced plates and shapes at a minimum. If required to be heated, in order to be formed, they subsequently must be heat-treated. In these cases the dimensions are important because of the limitations of the heat-treating furnaces. Wherever possible, the design should be such that cold forming will be all that is necessary.

The vessel today, and probably for some time in the future, will be riveted.

Pressure-Chamber Experiments

USING a small decompression chamber, which has taken laboratory animals up to simulated altitudes as high as 80,000 ft, Yale School of Medicine physiologists have gained new information on reactions of living organisms to pressure changes at great heights. It is believed that the findings, when completed, may have a bearing on the heights to which airplanes equipped with pressurized cabins can safely fly. Explosive decompression—the sudden loss of air pressure that may occur due to leaks or other failures in pressurized cabins—is also being studied.

After decompression at extremely high altitudes, the anoxia —lack of available oxygen—is sudden and complete in the lungs. Answers to questions of how this affects living organisms and how long breathing and consciousness will last, are being obtained through experiments on animals in the Yale pressure chamber.

In experiments with rats, it has been found that explosive decompression itself does not kill the animals, even at heights of 75,000 ft. If a rat is promptly recompressed, its breathing recovers spontaneously after approximately 18 sec, and the heartbeat is resumed. If the rat is not brought down to sea level or tolerable altitudes soon enough, however, it will die.

The Yale research has also shown that an explosively-decompressed rat stops breathing after 18 sec at all altitudes above the 52,000-ft level. This is true because at this height barometric pressure becomes equal to vapor and carbon-dioxide pressure in the lungs of all mammals. Hence no oxygen is available to the lungs.

The chances decompressed rats have of reaching sea level alive after descending through air at a free-fall rate from various altitudes were found by experiment to be as follows: From 50,000 ft, 100 per cent; from 55,000 ft, 37½ per cent; from 60,000 ft, 25 per cent; and from 65,000 ft, zero per cent.

It is believed that the rat dies in a fall from 65,000 ft because, at a free-fall rate, it takes the animal almost three minutes to reach the 20,000-ft level, a tolerable altitude for a rat.

In a fall through oxygen, however, the decompressed rat's chances of survival are better. The Yale research group said that even when descending from 75,000 ft, at a free-fall rate, a rat has a 50 per cent chance of surviving. For humans, an oxygen mask therefore might become a significant factor in

chances for survival, but not until the person had descended to about the 40,000-ft level.

The aeromedical unit, which has operated pressure chambers since 1940, is continuing its experiments with monkeys to obtain data more directly applicable to humans. All aeromedical research at Yale from November, 1941, until the end of 1945 was carried out with military secrecy under contract with the Office of Scientific Research and Development. Since 1946 unit studies have been supported by grants from the Army and Navy.

Besides the animal chamber, the unit has a larger experimental chamber for human beings, which was installed in 1942. Pressure changes from sea level to 40,000 ft can be attained in four minutes in this chamber, which can also change temperatures from +70 F to −70 F in the same time interval.

Moisture and Temperature Control

BULLETIN No. 26, entitled "Moisture and Temperature Control in Buildings Utilizing Structural Insulating Board," by Frank B. Rowley, Millard H. LaJoy, and Einar T. Erickson, has recently been published by the Engineering Experiment Station, University of Minnesota.

This publication is a continuation of previous studies on the vapor transmission of structural insulating boards, sponsored co-operatively by the University of Minnesota and the Insulation Board Institute. The purpose of this investigation was to observe the occurrence of moisture condensation and the distribution of temperatures in various building constructions utilizing structural insulating board. Interior and exterior surface finishes of specific vapor permeability rates are recommended with respect to effectively reducing moisture condensation in residential structures.

In addition, a detailed study of attic ventilating requirements to prevent the formation of frost in the attic and its effect on attic air temperatures and heat loss through the combined ceiling and attic are presented. The Bulletin includes descriptions and illustrations of the test apparatus, test methods, and complete test results.

Copies can be obtained from the Engineering Experiment Station, University of Minnesota, Minneapolis 14, Minn., at 50 cents per copy.

Ramjet Helicopter

THE U. S. Air Force's ramjet helicopter, said to be the first rotary-wing aircraft ever to employ this type of power plant, has successfully completed six months of flight testing at the St. Louis, Mo., plant of the McDonnell Aircraft Corporation.

Developed after almost two years of research and close cooperation between engineers of Air Materiél Command at Wright Field, Ohio, and the McDonnell Aircraft Corporation, the ramjet helicopter is actually a three-dimensional aerial motorcycle consisting only of a two-blade rotor, 18 ft in diameter, with a ramjet power unit at each tip, a small rudder, and an open steel-tube structure supporting the pilot, fuel tanks, and controls. The present configuration is merely a flying test stand intended to prove the basic idea, and no aircraft designation has been given the airplane.

Although it weighs only 310 lb, the helicopter has already lifted an additional useful load of 300 lb, and has attained a forward speed of 50 mph. An important feature of the helicopter is the rotor-tip ramjet power unit, which weighs only 10 lb and is attached to the tip of each of the all-metal blades. Since power is applied directly to the blade tips, heavy engine parts, gear systems, and transmissions are eliminated, thereby greatly reducing the weight of the craft.

The ramjet power unit is simple in design, resembling a stovepipe. The whirling rotor blades will "ram" air into the duct, which is burned by a fuel mixture injected through the blade and forced out the rear of the tube, producing thrust. Since the ramjets function only at high speed, an auxiliary starter is required, the ramjets attaining proficiency when the blade tips reach a speed of 600 fps.

Fuel for the power plant thus far has been propane, although engineers are now working on gasoline-burning ramjets which would eliminate the necessity of carrying a special fuel supply for the helicopter into areas where the craft might be in operation. Two tanks attached to the lower fuselage supply fuel through lines into the blades. After initial fuel pressure is built up, centrifugal force provides the necessary pumping action for keeping the system in operation.

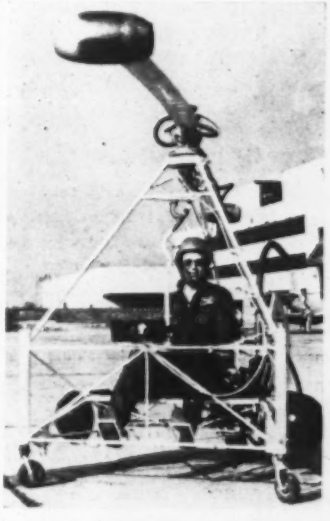


FIG. 10 RAMJET HELICOPTER

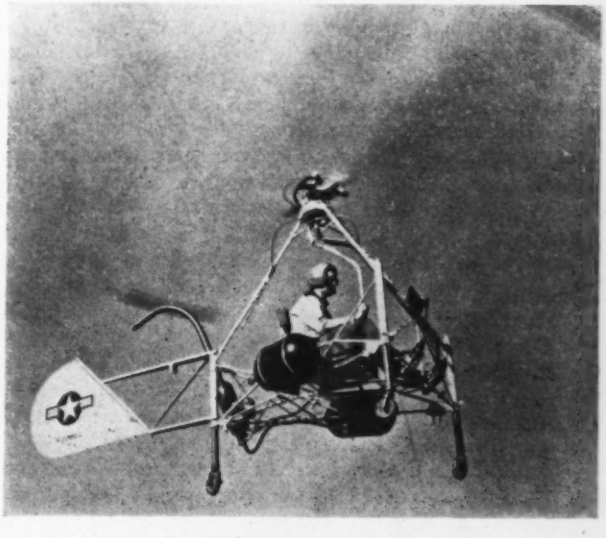


FIG. 11 RAMJET HELICOPTER IN FLIGHT

The initial flight of the ramjet helicopter was made May 5, 1947. It was made with fuel fed through a line from a supply on the ground, but subsequent flights were made with fuel carried aloft in tanks attached to the frame.

Acid-Cleaning Boilers

SOME fundamental data relative to inhibited acid cleaning of boiler tubes were presented by J. L. Wasco and F. N. Alquist, research chemists, The Dow Chemical Company, Midland, Mich., at the 1947 Semi-Annual Meeting, Chicago, Ill., of The American Society of Mechanical Engineers.

The authors stated that the removal of sludge, scale, and corrosion products from boilers and other heat-exchange equipment has met with the approval of boiler operators throughout the country. It is claimed that the boiler operator can clean his boiler faster, more completely, and with much less trouble by using the acid-cleaning service than by other methods. As a result of being able to clean all boiler surfaces by acidizing, the boiler manufacturer can simplify the boiler design.

Laboratory tests were made to show the effect of inhibited hydrochloric-acid solutions on the normal surface of six specimen boiler tubes. These tests indicated that the six tubes tested, each of which was of a different specification, were equally well protected from acid attack by either Dowell A12 or A23 inhibitors.

TESTING PROGRAM

The chemical specifications of the six tubes which were obtained directly from various manufacturers are listed in Table 1. Test specimens were prepared by sawing the tubing into 5-in. lengths. The burrs were removed and identification numbers were stamped on the tubes. The protective paint was removed by dipping the test specimens into an organic solvent to loosen the paint, followed by scrubbing with soap and water. The mill scale and other foreign material were removed by placing the tubes into uninhibited 5 per cent HCl until the tubes were clean and a free evolution of hydrogen was obtained from all portions of the tube. The tubes were then washed in water and allowed to soak for an hour in boiling 1 per cent Na_2Co_3 solution. This last treatment neutralized the acid which adhered to the tubes and prevented them from rusting during subsequent weighing. The tubes were dried in air and weighed to the nearest hundredth gram. The weights of the specimens ranged from 900 to 2400 grams (2 to 5.5 lb) because of differences in the diameters of the tubes.

TABLE 1 CHEMICAL SPECIFICATIONS OF SELECTED BOILER TUBING

Specification designation	Constituents, per cent by weight C	Mn	P (max)	S (max)	Si
SA 83	0.08 to 0.18	0.3 to 0.6	0.04	0.045	.....
SA 83A	0.08 to 0.18	0.3 to 0.6	0.04	0.045	.....
SA 106B	0.35 max	0.35 to 1.00	0.04	0.06	0.10 min
SA 161	0.10 to 0.20	0.30 to 0.60	0.04	0.04	0.10–0.50
SA 178A	0.08 to 0.18	0.3 to 0.6	0.04	0.045	.....
SA 192	0.08 to 0.18	0.3 to 0.6	0.04	0.045	0.25 max

A rather large test specimen was selected in order to lower the percentage of cut surface of the tube. The purpose of the tests was to measure the corrosion of the normal surface of the tube rather than the cut surface.

The tube specimens were used for more than one test. This was necessary because of the large specimens. The procedure applied to each specimen between tests, thus eliminating the effect of one test upon another, follows: (1) Wash with soap and water; (2) soak for 1 hr in a boiling 1 per cent Na_2CO_3 solution; (3) dry from acetone and weigh back; (4) soak for 30 min in 5 per cent HCl (uninhibited) solution at 160 to 175 C; (5) soak for 1 hr in a boiling 1 per cent Na_2CO_3 solution; and (6) dry from acetone and weigh for next test.

All acid solutions were made by diluting 36 per cent chemically pure hydrochloric acid with distilled water. The inhibitor (0.4 per cent by volume) was added directly to the test container.

Three inhibitors were used in these tests: A12, A23, and an inhibitor "Q" selected from a list in Bulletin G-39A, "Chemical Cleaning of Internal Heating Surfaces," published by The Babcock and Wilcox Company.

The volume of the acid solution used in each test was governed entirely by the surface area of the test specimen and was 150 cc of acid solution per 8 sq in. metal surface or 0.714 gal per sq ft. This ratio was adhered to in all tests but one. In this isolated case, the volume was increased in order to completely immerse the test specimen.

The test containers were standard-size beakers covered with watch glasses.

A boiler deposit of "scale" was added to some of the tests to find its effect on corrosion rates. This consisted of a mixture of deposits, from several high-pressure boilers, which had been ground to pass through a 30-mesh screen and mixed thoroughly.

X-ray analysis of the scale showed it to contain 50 per cent magnetic iron oxide, 20 per cent sodium ferrous phosphate, 20 per cent hydroxy apatite, 10 per cent magnesium hydroxy phosphate, and a trace of metallic copper.

A partial chemical analysis of the deposit showed it to contain 36.6 per cent iron and 1.13 per cent copper.

The amount of scale to be added in each test was based on the thickness of iron-oxide scale of some large utility boilers at the time of acidizing. These data showed that the scale thickness of the average high-pressure boiler was 0.001 in. This is an average thickness based on the amount of iron in drained acid solutions. A thickness of 0.001 in. of Fe_3O_4 is equivalent to 0.080 gram Fe_3O_4 per sq in. of surface or 0.160 gram of 50 per cent Fe_3O_4 scale per sq in. of surface. Therefore 0.160 gram scale per sq in. of surface was the standard amount of scale added to the tests although a few tests were made using one half or twice the amount.

TESTING PROCEDURE

The inhibited HCl solutions were made up in individual beakers which were set in constant-temperature water baths. The beakers were covered with watch glasses to lessen the evaporation of the acid. Three thermostats were used, one each at 140, 160, and 180 F. When the temperature of the acid solutions came to equilibrium, the previously weighed specimens were placed in the beakers and left undisturbed for 6 hr. At the end of this time the specimens were removed, scrubbed in soapy water, and placed into a boiling 1 per cent Na_2CO_3 solution for at least one hour. They were then either dried in air or rinsed in a volatile solvent, dried, and reweighed.

If boiler scale was used in the test, it was stirred into the acid immediately before the specimen was introduced. Three times during the test, at $1^1/_2$-hr intervals, each solution was stirred again to help disperse the iron-salt accumulation in the lower portion of the beaker. Since the scale contained a small percentage of metallic copper, the specimens became copper-plated during the test. The copper plate was removed before weighing back the specimens by soaking them in an ammoniacal solution of ammonium carbonate and ammonium persulfate.

DISCUSSION OF EXPERIMENTAL RESULTS

The inhibitor is the most important agent among those to be

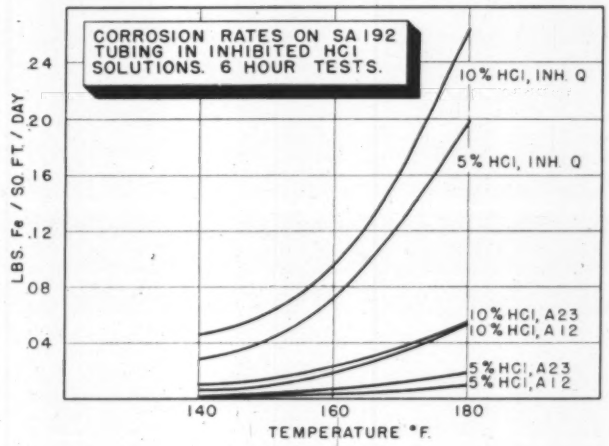


FIG. 12

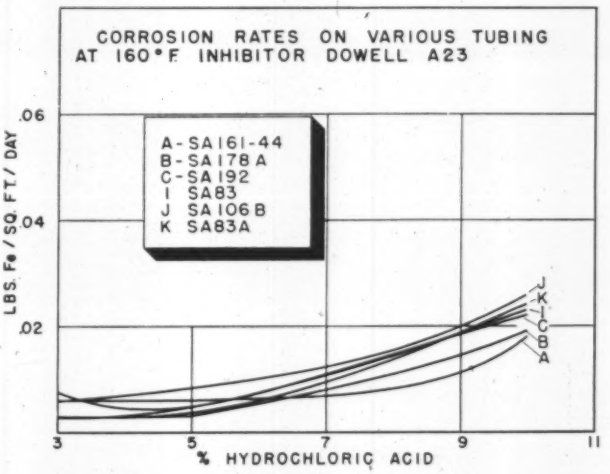


FIG. 13

selected before acid-cleaning any equipment. There are many inhibitors on the market and each is more or less efficient in inhibiting the action of the acid on metal. However, all inhibitors are not equally efficient. This is depicted in Fig. 12 which shows the corrosion rates of SA192 boiler tubes in 5 and 10 per cent hydrochloric-acid solutions inhibited with three inhibitors. Dowell A12, Dowell A23, and inhibitor Q were used.

Fig. 12 also shows that metal corrosion by inhibited acid increases with rise in temperature or concentration of the inhibited hydrochloric-acid solution.

Each of the six tubes tested, although of a different specification, was equally well protected by the inhibitor. Fig. 13 shows the corrosion rates of the tubes in 3 to 10 per cent HCl with A23 inhibitor at 160 F. The curves are all grouped in a small portion of the graph, and follow the same trend. The average corrosion rate of the six tubes, under the most severe conditions of 160 F and 10 per cent HCl, was only 0.022 lb per sq ft per day. This is said to be an exceedingly low corrosion rate for such conditions.

Fig. 14 shows the effect of temperature on the corrosion rate of the various steels in 5 per cent HCl inhibited with Dowell A23. At 180 F the corrosion rates fan out somewhat showing differences between tubes. At 140 and 160 F very little difference exists between the corrosion rates of the various tubes.

The data discussed thus far have been on corrosion rates of steel tubes in inhibited acid without any boiler scale present. This condition never exists in acid cleaning boilers, so some tests were made with a boiler deposit present to find what effect the presence of scale had on the corrosion rate. Fig. 15 shows, in general, that the addition of scale containing ferric oxides increases the corrosion rate slightly. The increase in corrosion rate varied directly with the amount of scale added. Interesting data are obtained from the 10 per cent HCl, 180-F curve which shows a decrease in corrosion due to scale addition. A plausible explanation for this condition is that the small amount of metallic copper which was in the scale dissolved in the acid and redeposited on the tubes giving a protective coating. This would prevent the acid from attacking the tube and lowers the corrosion rate.

The foregoing data indicate the following: (1) If A12 or A23 are used as inhibitors the amount of corrosion obtained on any of the six tubes is not excessive; (2) the presence of a boiler scale containing 50 per cent Fe_3O_4 and some metallic copper increases the corrosion rates of the tubes only slightly; and (3) the selection of an inhibitor is important because the degree of protection afforded by inhibitors varies greatly.

It is recommended, however, that in acid-treating a boiler, the temperature be held as low as possible. If the inhibitor

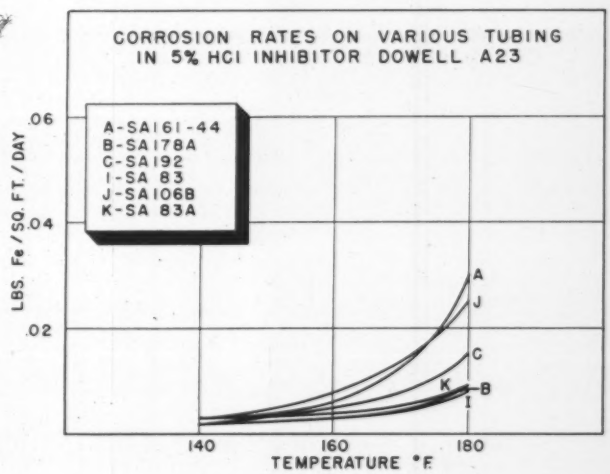


FIG. 14

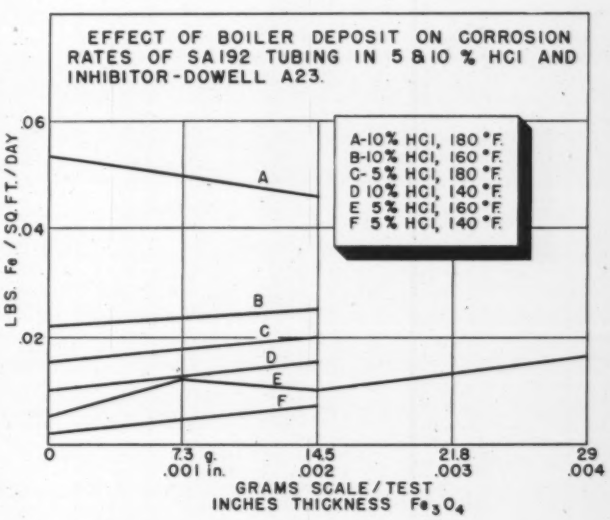

EFFECT OF BOILER DEPOSIT ON CORROSION RATES OF SA192 TUBING IN 5 & 10 % HCl AND INHIBITOR-DOWELL A23.
A-10% HCl, 180 °F.
B-10% HCl, 160 °F.
C-5% HCl, 180 °F.
D 10% HCl, 140 °F.
E 5% HCl, 160 °F.
F 5% HCl, 140 °F.
LBS. Fe / SQ. FT. / DAY
.02
.04
.06
0
7.3 g. .001 in.
14.5 .002
21.8 .003
29 .004
GRAMS SCALE / TEST
INCHES THICKNESS Fe_3O_4

FIG. 15

protects very well at 180 F, and tests show that the boiler deposit is completely soluble at 150 F, the acid cleaning should be done at 150 F. The reason for low temperatures during acid treating is that every boiler contains some stressed metal such as the rolled and flared ends of the tubes. Metal which has been stressed by cold-working corrodes at a higher rate while lower treating temperatures will reduce this attack.

Heat-Resisting Lubricants

TWO materials having interesting applications as high-temperature lubricants but still in the experimental stage are described in the *Westinghouse Engineer*, November, 1947, by G. L. Sumner, materials engineering department, Westinghouse Electric Corporation. One is molybdenum sulphide, the other is boron nitride.

MOLYBDENUM SULPHIDE

Molybdenum sulphide, known as "moly sulphide," is a mined product refined by oil flotation and marketed as a finely divided black powder. In this state it contains inherent abrasive materials, mostly siliceous, which must be removed by a special treatment. It also contains other impurities such as polysulphides, oxides, acid-soluble salts, free sulphur, and varying amounts of the flotation oils, which require special and careful processing for removal.

This dry, refined powder is said to exhibit remarkable properties in reducing the friction of moving steel parts, particularly at high temperature where ordinary lubricants such as oils and greases rapidly oxidize and fail to provide lubrication, and where heavy pressure is brought to bear on small areas such as in the lubrication of center stocks in machining operations. It is also reported to be effective as an experimental dry lubricant of ball bearings. Favorable results have been obtained in tests under both normal and high-temperature conditions by impregnating, or, perhaps better, coating the surface by rolling the balls and retainers in the dry powder. Naturally, the bearings lubricated in this manner are noisy, in view of the absence of a cushion of oil or grease to deaden the sound. Considerable reduction in noise is obtainable through the use of Micarta retainers.

Molybdenum sulphide can also be used effectively in combination with other materials such as mineral oils, various kinds and types of grease, and with synthetic lubricants such as those of silicone base. In such combinations the material with which it is mixed can either be used to coat the metallic surfaces with "moly" or the vehicle may contribute to lubrication by its inherent oiliness.

Experiments indicate that a layer of molybdenum sulphide provides a cushion when applied on steel to steel, which aids in reducing the friction on moving parts, in much the same manner as an oil film but apparently not to the same degree. However, it has an advantage over the oil film in that it does not thin out with heat, and it is largely for this reason, and because it does not appear to become readily oxidized at even relatively high temperatures, that it offers possibilities for improvement in stability for high-temperature applications. In certain applications, when oils or other lubricants will not stay put, and where high temperatures obtain (even up to several hundred degrees F), it appears that molybdenum-sulphide powder will fill a long-felt need.

Additional experiments have indicated the usefulness of molybdenum-sulphide powder in combination with lubricating oils covering ranges in viscosities from 50 sec at 100 F, in the light oils to heavy-bodied oils having viscosities up to 200 sec at 210 F or higher. With light oils particularly, the powder tends to settle so that agitation just prior to use is desirable.

Molybdenum sulphide has sometimes been used suspended in a solvent, such as mineral spirits, whereby the solvent evaporates and leaves the moly deposited on the bearing surfaces. This means of application is not normally recommended because of the tendency for oil and powder to separate and also because the solvent offers a fire hazard.

Molybdenum-sulphide powder has also been found effective in the lubrication of chains on conveyers operating in ovens and elsewhere at temperatures up to several hundred degrees F when applied by means of a "puff can" or spray gun. However, this dusting-on method is wasteful unless the excess or nonadhering portion is caught for re-use. In this application, the higher cost of molybdenum sulphide as compared with other lubricants may be justified because of its resistance to oxidation at these high temperatures. Also, its noncarbonizing properties and its ability to reduce labor costs materially due to a substantial decrease in lubrication schedules are in its economic favor. Another advantage is that it does not appear to build up a nonlubricating film or coating under these high temperatures that requires removal before adequate lubrication may be obtained. Apparently, addition of more powder is all that is necessary for uninterrupted service.

Molybdenum sulphide can be suspended in water by emulsifying gums and chemicals and applied by brushing or spraying. In this form, where moisture is present, there has been some evidence of tendency for corrosion, which even the use of protective chemicals has failed to eliminate completely. However, the temperatures in hot-chain applications should readily evaporate moisture so that danger from corrosion is greatly reduced if not completely eliminated. This method of application should be economical unless the materials being carried on the chain conveyer are subject to contamination with, or are affected by the vapors.

BORON NITRIDE

In contrast to moly, boron-nitride lubricant is a light fluffy white powder, which was first produced as a by-product in the manufacture of igniters for ignitron rectifiers. It is now produced synthetically, primarily for use in the manufacture of igniters, but in only relatively small amounts because manufacture is slow, laborious, and requires high temperatures (1900–2000 C).

Its use as a powder without a vehicle or binder is almost prohibitive because of cost. However, in combination with other lubricants in the amount of 5 to 25 per cent or even higher, its cost can be justified in certain applications. However, the use of boron nitride as a high-temperature lubricant (it is very doubtful if its use could be justified in low- or medium-temperature work) is still definitely in the experimental stage of development.

Boron nitride, because it is the product of the arc furnace, obviously should be able to remain unchanged for an almost indefinite period in high temperatures. However, this white powder does not appear to have the property of forming a layer of film on metal similar to molybdenum sulphide and experiments confirm the thought that it can best be used in combination with some other lubricating material.

The most logical combination would be with a material which had at least some inherent lubricating properties as well as stability at high temperatures. This led to the trial with silicone bases which thus far seem to be best suited for incorporation with boron-nitride powder.

Combinations of molybdenum sulphide, boron nitride, and silicone bases are also possible, though the relative merits of lubricants in varying percentages have not yet been properly

evaluated. It is doubtful whether improvement in lubricating properties over straight silicone-boron nitride combinations can be effected, although some cost reduction in favor of molybdenum-sulphide methods is possible.

One of the main reasons why boron nitride has not been extensively used as a high-temperature lubricant is its high cost. As manufactured at present it costs nearly $100 a pound—an exorbitant figure for a lubricant. This cost might be greatly reduced if the demand were sufficient to warrant its manufacture on a production basis.

Apparatus Research Laboratory

NEW uses for the industrial gases in the production and finishing of steel products are among the important research activities now being conducted by Air Reduction Company at its new Apparatus Research Laboratory in Murray Hill, N. J. The laboratory was open for inspection to members of the press, guests, and company officials on Nov. 18, 1947, and demonstrations of certain of the processes were given, including cutting of hot steel billets with the oxyacetylene flame, the use of industrial gases in steelmaking operations, the new method of scarfing stainless steel, heliwelding of nonferrous metals, and machine gas cutting with an electronically controlled tracing device.

Perhaps most important of the industrial gas applications which engage the company's researchers involves the use of oxygen as an aid in the combustion of fuel in steel melting and the control of hot-metal analysis. Test work already conducted in the open hearth indicates that the relatively long period involved in melting down steel scrap may be shortened as much as 40 per cent, but final figures will not be available until further experimental work has been completed.

Considerable experimental work is continuing in extending the use of oxygen in the foundry cupola and in the Bessemer furnace. A tonnage-oxygen plant is now being constructed jointly by Air Reduction, Koppers Company, Inc., and Bethlehem Steel Company, at Johnstown, Pa. When completed it will permit accurate determinations of the problems involved in the manufacture of large volumes of low-purity oxygen, and in the use of oxygen for the blast-furnace production of iron and ferrous alloys. Other industries, including those connected with ore mining and smelting, copper and brass refining, coal gasification and petroleum production, are following these developments with great interest.

Another recent application of oxygen in the steel industry involves the cutting of hot blooms and billets. The usual steel-mill practice is to cut hot blooms mechanically with a shear. When one considers that every bloom is cropped on both ends several times until sound metal has been reached, and that many blooms are cut into two or three parts after rolling, it becomes apparent that the duty of such a shear is quite heavy. The cost of maintenance of the mechanical shears and the cost of the shear blades, which have to be replaced frequently, is substantial. Furthermore, the initial cost of a hot cut-off shear is said to be in the neighborhood of $100,000. It is reported that because of these reasons, replacement of hot cut-off shears with oxygen cut-off machines appears to be quite attractive. However, the economy of the substitution is contingent upon the ability to make cuts at speeds approximating those of the shear, and research efforts are being directed at speeding up the oxyacetylene-cutting process.

The use of industrial gases for refining metals has advanced rapidly in the past two years. Initial experiments in this field have been made in the steel industry where oxygen is injected into the molten bath of the open hearth to bring about rapid carbon reduction. This is said to raise production as much as 25 per cent compared with the slag-metal practice. Already this use of oxygen has become a regular production tool for plants making very low-carbon steels. "Flushing" various molten metals with other gases such as nitrogen, helium, and argon, has been found beneficial in eliminating certain physical defects which might otherwise occur in the solidified product, such as porosity, poor grain structure, brittleness, and the like.

Surface imperfections which develop in the casting and subsequent rolling of steel must be removed in order to obtain a quality product. In the case of ordinary steels, this has been done by scarfing, a process which consists of removing a

FIG. 16 AERIAL VIEW OF NEW APPARATUS RESEARCH LABORATORY

thin layer from the surface of the metal through use of the oxyacetylene flame. Until recently, however, this process was not applicable to the stainless steels because of the refractory nature of the oxides formed and it was necessary to remove defects by chipping and grinding, an expensive and time-consuming measure.

The scarfing of stainless steels is reported to be possible through the use of a flux, which has the property of reducing the melting point of the refractory oxides formed, so that the oxidizing action can be generated. The flux is injected into the oxygen stream and passes through the flame, coming into intimate contact with the metal being scarfed.

Also of importance has been the development of inert-gas applications, using nitrogen or hydrogen as a base, for the protection of metals during heat-treating. In the manufacture of tin plate for the canning industry, in the production of high-silicon transformer steels for the electrical industry, and in the making of high-grade alloy steels for the automotive industry, protective atmospheres are playing an increasing role in improving product quality.

Heliwelding is a descriptive term originated by Air Reduction to cover its activities in the increasingly important field of inert-gas shielded arc welding. Although the idea of shielding a welding arc with an inert gas is old, it attained commercial importance during the war years in meeting the urgent need for a better method of welding magnesium, aluminum, and stainless steel.

Further research work on the heliwelding process has demonstrated its remarkable versatility for fabricating most of the ferrous and nonferrous metals and alloys which hitherto have been considered difficult to weld. This has led to the development of an improved water-cooled heavy-duty manual holder and the recently introduced heavy-duty machine holder and fully automatic apparatus.

These are just a few of the processes on which a staff of some 250 engineers, metallurgists, physicists, chemists, technicians, and machinists are now working. Numerous other applications are still in the embryonic stage and as these processes come out of the laboratory they will serve to open additional new fields for the industrial gases.

The main building of the new laboratory is a red-brick structure with all-welded steel framework and provides some 78,000 sq ft of floor space. There are also two service buildings—an acetylene generator house and a combination boiler room and garage.

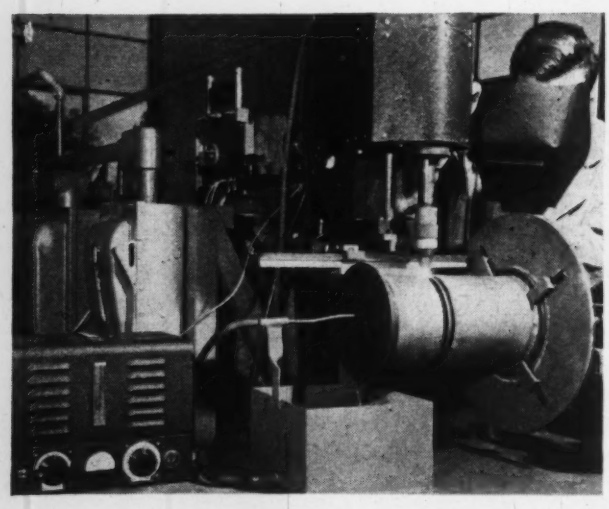


FIG. 17 ELECTRONICALLY CONTROLLED AUTOMATIC HELIWELDING OF STAINLESS-STEEL DRUM

FIG. 18 ELECTRONICALLY CONTROLLED TRACING DEVICE
(The device forms part of equipment in new apparatus laboratory. It guides the flame-cutting machine for accurate reproduction in metal of intricately shaped part directly from simple outline drawing.)

Because of the specialized nature of the research work, most of the laboratory space is serviced with outlets carrying high- and low-pressure oxygen, acetylene, nitrogen, city gas, compressed air, and 440-volt three-phase and 110-volt single-phase electric current, and hot and cold water.

In addition to a main high-ceilinged machine shop and test and assembly area where special experimental machinery and apparatus and prototypes of production equipment are made, there is another high-ceilinged, especially ventilated, flameproof area for conducting experiments in the combustion of gases and processing of metals. There are also a number of conventional service laboratories, such as an x-ray room, chemical laboratory, mechanical testing laboratory, and metallographic laboratory, plus specially equipped laboratories, including a high-pressure oxygen laboratory and a compressed-gas-cylinder testing laboratory.

A drafting and design room with windows on three sides in order to take full advantage of the natural light is located in one of the wings. This ceiling, as well as all ceilings in the offices and corridors, contains fluorescent lighting fixtures recessed into a hung acoustical ceiling.

Approximately 50 two- and three-man offices are provided for those engaged in engineering and research, thus insuring the privacy necessary for creative thinking. The exact number of rooms is variable since the building is of the modular unit type utilizing portable steel partitions so that the number and dimensions of these rooms can be altered at will.

A modern cafeteria, owned and operated by the company on a nonprofit basis, occupies the only part of the building more than two stories in height.

Gridded Bearings

A PROCESS to precision-build high-speed heavy-duty gridded bearings practical for widespread use at mass-production savings has been developed by the American Brake Shoe Company, St. Louis, Mo., according to a recent announcement.

It is stated that most authorities agree that a good bearing

must have the following properties: (1) Fatigue strength—ability to resist cracking or other failure under repeated stress—directly related to compressive strength of base material; (2) embedability—ability to embed or absorb dirt or grit within itself without harm to bearing or shaft; (3) conformability—ability to conform to distortion under firing loads and working tolerances; (4) seizure resistance—ability to withstand scoring or seizing under metal-to-metal contact; and (5) corrosion resistance—ability to withstand acids generated by lubricating oils.

In general, babbitts are known as the best bearing materials within their strength limit. They readily embed dirt and grit and work well with all common types of shaft material. They will endure insufficient or intermittent lubrication and considerable distortion. In short, babbitts' strong points are conformability, embedability, and seizure resistance.

But babbitts fail when stressed or pounded too heavily. Therefore newer materials were tried, such as copper-lead steel back bearings, and various types of bronze. All have their advantages, but none has the tolerance of babbitts. These stronger materials require harder shafts, more and cleaner lubricant, better journal surface finish, and greater constructional accuracy.

Bronze backing proved to have some advantages over steel. Its high thermal conductivity quickly transmits heat and equalizes the temperature over the entire bearing to prevent local cracking. Good bronze also provides superior conformability without fatiguing.

Shortly before the war, when steel tubing became available, the centrifugally cast lead-tin bronze bearing was developed. Its casting technique produces solidification from one direction only, which eliminates the usual middle-wall weakness of cast material caused by solidification from each surface toward the center. This type of bearing has great fatigue strength and is proof against hydraulic pressure—a prime requisite for heavy-duty service. With a 0.002-in. lead-tin coating in the bore, it gave outstanding service during four years of wartime use. But increasing loads brought on by the war required even better bearings, and the search went on.

Gridding the centrifugally cast lead-tin bronze, to combine its advantages with those of babbitt, was the next logical step. It was here that a simple mechanical method of gridding that is said to make gridded bearings practical for mass production was developed.

The result is an almost ideal combination of good bearing properties. The gridded area provides conformability in a strong bronze bearing, plus embedability equal to that of the babbitts. It also overcomes objections to using bronze with a shaft that is not hardened, because the gridded bearing is "self-healing." In periods of great overstress, some of the babbitt melts out of the grids and forms a running surface that prevents seizure. Where an ordinary bearing would seize and fail, the babbitted grids provide a safety factor that prevents damage to the shaft.

To increase further the seizure resistance and corrosion resistance of gridded bearings, a 0.002-in. run-in surface of lead-tin electroplated in the bore was added.

Present applications of gridded bearings are main and connecting rods of heavily-loaded Diesel engines and similar heavy-duty service. They are now operating under loads of more than 3500 psi projected area, with shafts as low as 160 Brinell hardness. Minimum depth of grids is 0.008 in.; minimum area of babbitt is 40 per cent. The required balance of conformability and embedability for individual applications is obtained by controlling the proportion of land (the parent bronze) and the babbitt-filled grid.

Stratosphere Balloons

IN line with the current policy of the U. S. Navy to give scientific investigators access to research tools which would not otherwise be available to them, the Navy Department has announced that plans are continuing for the development of balloons capable of carrying instruments in unmanned flights to an altitude of 100,000 ft.

Currently under development at the General Mills Aeronautical Research Laboratory, Minneapolis, Minn., the balloons when completed will be able to carry up to 70 lb of scientific instruments into the upper atmosphere. When clustered in groups of two, three, or possibly four, it is hoped that correspondingly increased amounts of research equipment may be carried to the same height. In the usually strong plastic balloons, helium gas will be used.

Based on the large number of requests from universities and colleges, it is expected that scientific investigators will wish to send aloft various types of recording or telemetering equipment including cloud chambers for cosmic-ray investigations, neutron and proton counters, and various other upper-atmosphere research instruments.

Present plans call for the flights to be conducted in the vicinity of Minneapolis and possibly at the Naval Air Station, Lakehurst, N. J. The original plan called for a manned balloon flight and was scheduled for last summer. It was canceled because of operational difficulties and the need for more work on the balloon itself before it was considered a proper vehicle for such a flight. The Naval Ordnance Laboratory had been invited to participate in the original operation. It is believed, however, that the Laboratory will not take part in the coming balloon ascents, because of space and weight limitations and the time necessary for the development of special instruments for the flight.

Printed Electronic Circuits

A NEW publication containing technical information on printing electronic circuits has been announced by the National Bureau of Standards. Entitled "Printed Circuit Techniques," and written by Dr. Cledo Brunetti and Dr. R. W. Curtis, the booklet consists of 10 chapters and is adequately illustrated.

The methods of applying wiring and circuit components directly to an insulated surface, thus combining ruggedness with a high degree of miniaturization, are presented. Performance and application details as well as precautions and limitations are discussed. Many applications and examples are given, including printed amplifiers, transmitters, receivers, hearing-aid subassemblies, plug-in units, and electronic accessories. A section on comparative performance of printed circuit elements is provided, while a bibliography covering processes, patents, applications, and other relevant matters is included as a supplement.

By means of the printing process the conventional electronic circuit—characterized by a maze of wires, resistors, inductors, and condensers—is replaced by a compact circuit printed on a small flat plate, eliminating much of the third dimension and making it simple to check and repair. Since the war, the art has advanced to the point that complete circuits may now be printed not only on flat surfaces, but on cylinders surrounding a radio tube or on the tube envelope itself.

The new techniques are reported to simplify production methods and are said to offer cheaper, stronger, more compact, and more uniform electronic equipment, thus decreasing time and cost in assembly and inspection, as well as reducing pur-

chasing and stocking problems. Specific applications lie in the fields of electronic control circuits, electronic instruments, standard radio and television sets, pocket radios, personal radio telephones, miniature hearing aids, and meteorological instruments.

NBS Circular 468, "Printed Circuit Techniques," is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 25 cents per copy.

Electrodeposition

A METHOD of producing satisfactory electrodeposits of tungsten alloys on metal surfaces has resulted from investigations conducted at the National Bureau of Standards. Smooth thick deposits of tungsten alloyed with cobalt, nickel, or iron have been obtained from hot ammoniacal solutions containing organic acids. These alloys are quite hard and are said to retain their hardness at elevated temperatures, just as do the similarly constituted cast metallurgical alloys.

The commercial importance of tungsten alloys is directly related to their use in applications—such as bearings, pistons, cylinders, dies, molds, and machine tools—where hardness, corrosion resistance, or high strength at elevated temperatures are essential. Although efforts to electrodeposit pure tungsten have for many years proved unsuccessful, deposits of this metal alloyed with iron, nickel, and cobalt, have been produced by various processes. These methods, however, yielded specimens having unsatisfactory physical properties for many uses. Only a thin layer could be obtained, and this was weak because of cracks and oxide inclusions.

Of the alloys investigated by the Bureau, cobalt-tungsten was found to deposit most easily. In some of its properties it resembles the alloy Stellite. A typical solution for depositing cobalt-tungsten at the Bureau contains: Tungsten, 25 g/l (as sodium tungstate); cobalt, 25 g/l (as cobalt chloride or sulphate); Rochelle salt, 400 g/l; ammonium chloride, 50 g/l; and ammonia to a pH of 8.5 to 9. Plating takes place at a temperature above 90 C and at a current density of from 2 to 5 amp per square decimeter. The Rochelle salt may be replaced by salts of other organic hydroxy acids. As anodes, either tungsten, the appropriate iron-group metal, or a tungsten alloy may be employed. Tungsten anodes leave the least amount of residue when they go into solution, and may be used without bags. The solutions for depositing the iron- and nickel-tungsten alloys are very similar to the foregoing.

The maximum percentages of tungsten that may be obtained in this way are 35 per cent in the nickel alloy, about 50 per cent in the cobalt alloy, and about 60 per cent in the iron alloy. However, for sound alloys of desirable properties, the tungsten content must be lower than the maximum. For example, the cobalt alloys should have not more than 30 per cent of tungsten.

The nickel-tungsten and cobalt-tungsten deposits have good adhesion to steel and can be plated up to a thickness of 0.02 in. without becoming appreciably nodular. As formed, they are brittle and show a laminar structure under the microscope, but heating to suitable temperatures results in the disappearance of the laminations as the alloys become ductile.

The most interesting feature of the alloys obtained by this process is their hardness, which in the untreated nickel- and cobalt-tungsten alloys may be between 400 and 700 on the Vickers scale. The iron alloy is still harder, ranging from 700 to 900 Vickers; it is thus comparable in hardness to electrodeposited chromium.

Unlike most other electrodeposits, which soften with heat-treatment, reports indicate that these alloys may increase 100 points or more in hardness upon heating to 600 C. The cobalt-tungsten alloy is of further interest in that it maintains a fair degree of hardness even at quite elevated temperatures. For example, at 700 C the hardness of a carbon steel drops to about 50 Vickers, whereas the cobalt-tungsten alloy at this temperature has a hardness of more than 290 Vickers.

The resistance of the nickel- and cobalt-tungsten alloys to chemical attack is not much greater than that of either nickel or cobalt in the pure state, with the exception that they are much more resistant to nitric acid. In the salt-spray test, coatings of cobalt-tungsten alloy show less porosity and afford better protection to steel than do ordinary nickel coatings. However, the nickel-tungsten alloys are inferior in protective value to nickel coatings.

While tungsten alloys deposited from the solutions developed at the Bureau have not yet been utilized commercially, it is expected that they will find applications on surfaces that require hardness and durability at elevated temperatures. Because of the excellent throwing power of the solutions, it is said that these coatings are more readily applied to irregular-shaped surfaces than is chromium plate.

The electrodeposition section of the National Bureau of Standards will co-operate with those who are interested in plating small metal parts that can be subjected to a service test.

More complete details of this work are given in a paper by Abner Brenner, Polly Burkhead, and Emma Seegmiller, Electrodeposition of tungsten alloys containing iron, nickel, and cobalt, National Bureau of Standards, *Journal of Research*, RP 1834, vol. 39, 1947, p. 351.

Foundry Scholarships

CORNELL University recently announced the award of $6000 in scholarships under a $57,000 three-year program newly established at the university in conjunction with the foundry industry to provide candidates for engineering-management jobs in the field.

The scholarships are sponsored by the Foundry Educational Foundation, which has also granted the university an initial $10,000 for equipment to be used in the program. Under present arrangements, Cornell will receive an additional $41,000 over the next two years for further scholarships and equipment.

Worth $600 a year and renewable under present plans for three years, the scholarships are awarded to male engineering students on the basis of merit. Recipients will pursue foundry work and supplemental studies outlined by a faculty adviser, spend a summer in actual foundry work in industry during the course, and choose a foundry-related subject for a thesis or project.

The grants to Cornell are part of a three-year $280,000 plan under which the Foundry Educational Foundation is setting up similar scholarship-equipment programs in four other geographically distributed engineering centers—Case Institute of Technology, Massachusetts Institute of Technology, University of Cincinnati, and University of Wisconsin.

At Cornell, the program will be conducted within the curriculum of metallurgical engineering. Based on the university's long-established instruction in metallurgy, and reorganized recently to meet new developments in the field, the course will prepare the foundry students for their roles in the industry while continuing to train others for work in the other phases of metallurgical engineering.

Financed by contributions from the industry, the over-all program is designed to provide new leaders for a field which has undergone vast changes in recent years as a result of new developments in metals and casting processes.

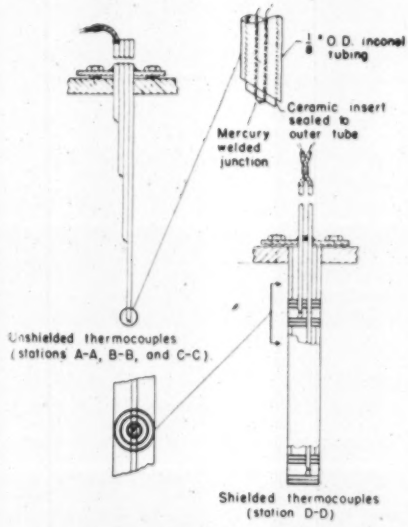
ASME TECHNICAL DIGEST

Substance in Brief of Papers Presented at ASME Meetings

Gas-Turbine Combustion Efficiencies

Temperature Measurements and Combustion Efficiency in Combustors for Gas-Turbine Engines, by Walter T. Olson and Everett Bernardo, Flight Propulsion Research Laboratory, National Advisory Committee for Aeronautics, Cleveland, Ohio. 1947 ASME Annual Meeting paper No. 47-A-23 (in type).

In investigations of the general altitude performance of combustors for aircraft gas-turbine engines at the Cleveland laboratory of the National Advisory Committee for Aeronautics (NACA), the combustors have been instrumented with a large number of thermocouples for determining average temperatures, temperature distributions, and combustion efficiencies. Presented herein is a discussion of the thermocouple installations used, some of the construction details of typical thermocouples, and representative temperature and combustion-efficiency measurements made in combustors. The results of numerous investigations of the general altitude performance of combustors for gas-turbine engines have indicated that air temperatures at the inlet to the combustors can be adequately measured with common bare-wire thermocouples, and that, at the combustor outlet, large variations in temperature distributions, nonuniform velocity distribution, and fluctuations in the temperatures are among the possible sources of errors in measuring the average combustor-outlet temperatures. In addition, the results indicate that the temperatures measured at the combustor outlet, although admittedly not accurate, are generally satisfactory for evaluating the altitude performance of combustors, and that the values of combustion efficiencies obtained from temperature measurements are satisfactory approximations of combustion efficiencies and serve to show the effect of primary variables on combustion efficiency.


1/8" O.D. inconel tubing
Ceramic insert sealed to outer tube
Mercury welded junction
Unshielded thermocouples (stations A-A, B-B, and C-C)
Shielded thermocouples (station D-D)

CONSTRUCTION DETAILS OF TYPICAL THERMOCOUPLES

Gas-Turbine Plant Combustion-Chamber Efficiency, by A. L. London, Mem. ASME, professor of mechanical engineering, Stanford University, Stanford University, Calif. 1947 ASME Annual Meeting paper No. 47-A-32 (in type).

Concepts of gas-turbine plant combustion-chamber efficiency are considered. Three distinct efficiency terms are required, one applying to incomplete combustion and setting losses, one to the flow friction and auxiliary-drive energy requirements, and the third to the influence of these losses on over-all plant thermal efficiency and output. These efficiencies are defined and details of application indicated. The proposed concepts are recommended for consideration as standards since they are thermodynamically meaningful, unambiguous, and relatively easy to apply both in evaluation of test performance and in cycle analysis.

Determination of Gas-Turbine Combustion-Chamber Efficiency by Chemical Means, by Peter Lloyd, Ministry of Supply, National Gas Turbine Establishment, Pyestock, Hampshire, England. 1947 ASME Annual Meeting paper No. 47-A-58 (in type).

Because of certain limitations of the heat-balance method of determining combustion-chamber efficiency, a more accurate chemical method of analysis has been developed utilizing the gravimetric technique. This method has the added merit of indicating the nature of combustion loss, which at times may be very useful. Various approximate methods, chemical, physicochemical, and physical can be devised, all of which require calibration against an exact and complete chemical determination. Details of the method and its application to the gas-turbine problem are presented.

How to Order ASME Papers

PAMPHLET copies of ASME papers referred in this section are available. Papers published in MECHANICAL ENGINEERING are not included. Coupon Books are available to ASME members at $2 for 10 coupons and $4 for 20 coupons (to nonmembers $2.50 and $5). Each coupon is good for one paper.

In ordering give title, author, and paper number. State number of copies wanted. Price 25 cents or 1 coupon per copy to ASME members; 50 cents or 1 coupon to nonmembers.

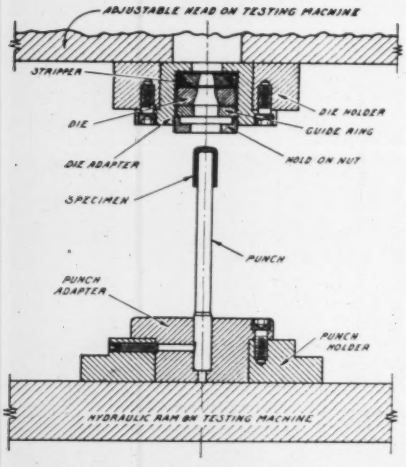
Send check with order to

ASME Publications Sales Department
29 West 39th St. New York 18, N. Y.

Tube Drawing

Effect of Some Processing Variables on the Stress Required to Draw Tubular Parts, by George Espey, metallurgical engineer, Lee Wilson Engineering Company, and George Sachs, Mem. ASME, Research Laboratory for Mechanical Metallurgy, Case Institute of Technology, Cleveland, Ohio. 1947 ASME Annual Meeting paper No. 47-A-10 (in type).

Tubular brass parts were drawn to determine the effects of a number of variables upon the draw forces and stresses. The variations were in the tube dimensions, the contour and finish of the die and punch, the temper and surface condition of the tubular parts, and the lubricant. The draw stress for a given reduction increased with decreasing die angle, this being the most important die variable. Radiused dies behaved in a manner similar to conical dies of the same contact area. Other die variables investigated had little effect upon the



EXPERIMENTAL DIE SETUP FOR DRAWING OR IRONING OF TUBULAR SPECIMENS

draw stress, these being various lengths of the cylindrical portion of the die at the exit (bearing or land), the die material, and the die finish. Tests with tapered punches yielded results similar to those obtained with cylindrical punches. Experimentation with punches of various degrees of finish revealed that rough punches gave higher draw forces than polished punches, particularly when used in conjunction with small-angle dies. A number of lubricants were investigated, none of which excelled the performance of a 2 per cent aqueous solution of soap. The draw stresses were found to decrease with increasing time of immersion in soap solution.

Heat Transfer

The Effect of Baffle Height and Baffle Clearance on Heat Transfer and Pressure Drop in Heat Exchangers, by Byron E. Short, Mem. ASME, professor of mechanical engineering, The University of Texas, Austin, Texas. 1947 ASME Annual Meeting paper No. 47-A-105 (mimeographed).

The heat transfer and pressure drop in shell and tubular heat exchangers with cross-flow baffles is affected in a large measure by both the baffle height and the baffle-to-shell clearance. The baffle height, for a given weight of fluid flowing through the exchanger, affects the velocity of the fluid through the baffle opening, the average velocity through the tube bundle, and the turbulence at the baffle and in the tube bundle. Higher baffles reduce the contraction effect of the fluid through the baffle opening but the core of the fluid stream is directed further from the center of the tube bundle as the baffle height is increased. The percentage of turbulence also increases as the baffle height is increased.

For the same fluid velocity through the baffle opening the heat-transfer rate and the pressure drop are decreased as the baffle height is increased.

The baffle-to-shell clearance affects the percentage of the fluid mass which passes through the tube bundle and thus for the same mass of fluid flowing through the exchanger, the heat-transfer rate is decreased as the clearance is increased.

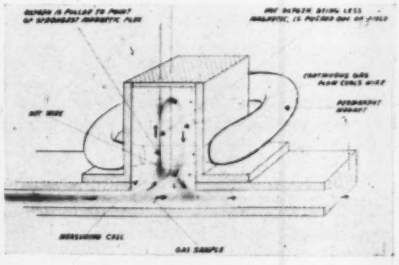
The clearance also affects the amount of turbulence on both the upstream and downstream sides of the baffle. An increase in this clearance also decreases the pressure drop because it decreases the quantity of fluid flowing across the tube bundle and also decreases the contraction and expansion effect which decreases the turbulence losses.

The heat-transfer rate is presented, in this paper, as a function of an effective velocity which includes the principal physical variables of the exchanger, and it is also presented as a function of the velocity at the baffle and a turbulence factor. This turbulence factor involves the physical variables of the exchanger. The pressure drop is presented as a function of the velocity at the baffle and a turbulence factor which measures the effect of the contractions' "sudden" expansions and the turning of the fluid stream.

Oxygen Measurement

Continuous Determination of Oxygen Concentration Based on the Magnetic Properties of Gases, by Robert D. Richardson, research engineer, The Hays Corporation, Michigan City, Ind. 1947 ASME Annual Meeting paper No. 47-A-38 (in type).

A new instrument for the continuous analysis of industrial gases for oxygen concentration has been developed. This instrument is based on the magnetic properties of oxygen and therefore the readings are not disturbed by any extraneous gases except some of the oxides of nitrogen. Actual tests show that the effect of gases other than oxygen are less than predicted by an examination of published values of the magnetism of gases.



PRINCIPLES OF OPERATION OF OXYGEN-RECORDING INSTRUMENT

The electrical impulse is picked up directly and measured on a recording bridge. A response of about 3 mv for 1 per cent oxygen is obtained. This instrument should prove to be a universal oxygen recorder for industrial gases.

Applied Mechanics

Mechanical Activation—A Newly Developed Chemical Process, by M. C. Shaw, assistant professor of mechanical engineering, Massachusetts Institute of Technology, Cambridge, Mass. 1947 ASME Annual Meeting paper No. 47-A-14 (in type).

In the course of a fundamental study of metal cutting it was found that cutting fluid encounters a rather unusual combination of conditions at the point of a cutting tool. The fluid is subjected to high local pressures of the order of the hardness of the metal cut, high local temperatures limited only by the melting point of the work material, and nascent highly stressed metal surfaces. This combination of conditions will, in general, promote a chemical reaction. The organic chemist uses reactions between metals and organic reagents in chemical synthesis, many of these so-called organometallic reactions being difficult to initiate and control. In this paper it is shown how the metal-cutting process may be employed in the preparation of organometallic compounds. The metal involved in the preparation is cut in the presence of the other reactants, thus utilizing the high-temperature, high-pressure, and highly stressed nascent surface produced at the point of cutting to start the reaction. This process has been called mechanical activation. This new chemical technique promises to give many extremely versatile organometallic reactions a commercial significance which they have heretofore lacked because their application was limited to batch rather than continuous processes by the inflammability and toxicity of the reactants, and the difficulty of starting and controlling the reaction.

The Flutter of a Uniform Wing With Tip Weights, by Martin Goland, Jun. ASME, chairman, Engineering Mechanics Division, and Y. L. Luke, staff mathematician, Midwest Research Institute, Kansas City, Mo. 1947 ASME Annual Meeting paper No. 47-A-36 (in type).

Forming an extension of a previously published work ("The Flutter of a Uniform Cantilever Wing," by M. Goland, *Journal of Applied Mechanics*, Trans. ASME, vol. 69, 1945, p. A-197) the present paper investigates the flutter

of a uniform wing in free flight carrying a fuselage at its semispan and a weight at each wing tip. Wing-tip weights arise in practice when, for example, wing-tip fuel tanks are installed. The flutter system is studied by solving the differential equations for the wing motion. Solutions are carried out for two representative airplane configurations and the resultant speeds, frequencies, and mode shapes at flutter are compared with those obtained on the basis of conventional Rayleigh-type flutter analyses. The methods of the original paper are considerably refined, resulting in a significant reduction in the amount of labor required to effect a solution.

The Hydrosphere—A New Hydrodynamic Bearing, by M. C. Shaw, assistant professor of mechanical engineering, and C. D. Strang, Jr., research associate in mechanical engineering, Massachusetts Institute of Technology, Cambridge, Mass. 1947 ASME Annual Meeting paper No. 47-A-122 (in type).

A fitted, spherical bearing has been found to operate hydrodynamically when subjected to large values of thrust or radial-thrust load. An examination of the geometry of this bearing fails to reveal the usual wedge-shaped oil film in the direction of motion of the moving bearing surface. However, a wedge does exist normal to the direction of motion. When Reynolds differential equation is applied to the bearing it is not evident whether this normal wedge is capable of producing positive pressure. When the differential equation for pressure is written with respect to co-ordinates directed along and perpendicular to a "mean streamline," it is apparent that a wedge normal to the direction of motion may produce positive pressure, provided there is flow in the normal direction. The results of several experimental tests are analyzed with respect to the qualitative theory presented, and the unique characteristics of this bearing are compared with those of other existing hydrodynamic bearings.

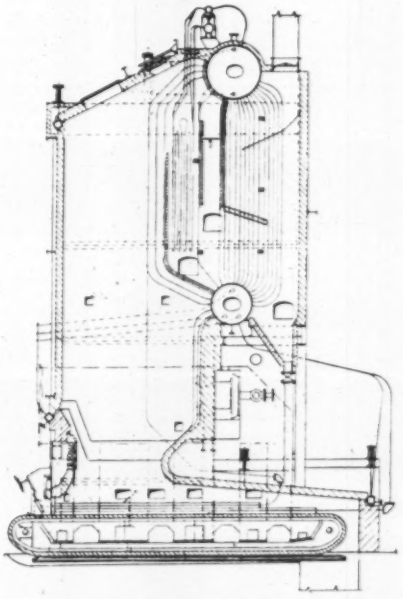
Vibration of a Beam With Concentrated Mass, Spring, and Dashpot, by Dana Young, Mem. ASME, professor of engineering mechanics, University of Texas, Austin, Texas. 1947 ASME Annual Meeting paper No. 47-A-9 (in type).

An analytical method is developed for determining the natural frequencies of a composite system which consists of a uniform beam with a concentrated mass, spring, and dashpot attached at any point along the length of the beam. The method makes use of a series expansion in terms of the set of orthogonal functions which represent the normal modes of vibration of the beam alone. Numerical examples are given for a beam with a combined concentrated mass and spring, for a beam with two concentrated masses, and for a beam with an attached dashpot.

By-Product Fuel Furnaces

Furnaces for By-Product Fuels, by Otto de Lorenzi, Mem. ASME, director of education, Combustion Engineering Company, Inc., New York, N. Y. 1947 ASME Annual Meeting paper No. 47-A-22 (in type).

Present-day costs of standard fuels such as coal, oil, and gas have advanced to a high level and concepts must now be revised regarding so-called refuse fuels. Their value as low-cost substitute fuels, for steam generation, will depend largely upon the manner in which they are prepared, and upon the use of suitable furnace designs. A number of furnace designs have been developed to handle by-product fuels from oil-refinery operations, and the manufacture of steel, coke, lumber, pulp, and sugar. Others are still in various experimental stages and many improvements in methods of drying, feeding, and burning fuels will be presently available. The characteristics of several of these fuels are discussed, and actual furnace designs illustrate the manner in which they are fired to provide process steam and save fuel dollars.

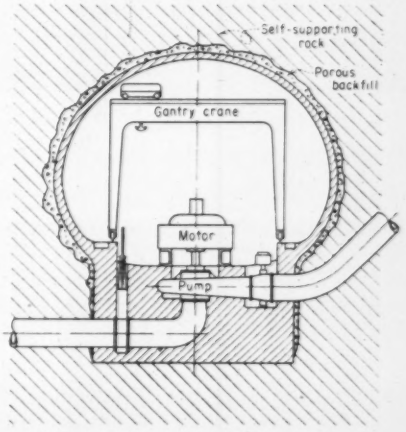


STEAM-GENERATING UNIT DESIGNED TO BURN COKE BREEZE OR COKE-OVEN GAS

Hydraulic Pumping Plant

Hydraulic Problems in Connection With the Design of the Granby Pumping Plant, by Eliot B. Moses, Mem. ASME, engineer, Bureau of Reclamation, Denver, Colo. 1947 ASME Annual Meeting paper No. 47-A-93 (mimeographed).

Many unusual problems arose in the design of the Granby Pumping Plant which delivers water across the Continental Divide in Colorado. Because of the 94-ft variation in suction head the pumps are located far below ground level. A design for a subterranean plant



A PROPOSED DESIGN FOR A SUBTERRANEAN PUMPING PLANT

with a cross section based on the hydrostatic arch is analyzed. Such a shape results in a considerable saving in concrete but is suitable only if the exterior hydrostatic and earth loads are fairly constant.

Because of the limitation to voltage fluctuation when starting up, imposed by a comparatively small power supply, several methods of bringing the unit up to synchronous speed were studied. One was by the use of a small impulse water wheel which was tested on a model pump. A detailed method for electric starting is analyzed wherein the motor torque is increased in uniform steps while the head, discharge, speed, and pump torque are all variable during the starting period.

The final design comprises a discharge valve which is closed when starting, equipment for depressing the water below the runner when starting at reduced voltage or when using the unit as a synchronous condenser, a surge tank, and a siphon at the upstream end of the discharge conduit. An air vent at the top of the siphon is provided to stop the reverse flow and an automatic vacuum pump removes the accumulation of air in the siphon.

ASME 1947 ANNUAL MEETING PREPRINTS

Pamphlet copies of the following ASME Annual Meeting papers are available from ASME Publications Sales Department, 29 West 39th St., New York 18, N. Y. See page 40 for details

Paper No.	*Title and Author*
	APPLIED MECHANICS
47—A-1	Thermodynamic Properties of Gas Mixtures Encountered in Gas-Turbine and Jet-Propulsion Processes, by JOSEPH KAYE
47—A-2	The Permanent Strain in a Uniform Bar Due to Longitudinal Impact, by MERIT P. WHITE and LEVAN GRIFFIS
47—A-3	Note on the Tightness of Expanded Tube Joints, by GEORGE SACHS
47—A-4	Torsion of a Rectangular Tube, by J. M. KLITCHIEFF
47—A-5	The Absolute Calibration of Electromechanical Pickups, by HORACE M. TRENT
47—A-6	On the Use of Power Laws in Stress Analysis Beyond the Elastic Range, by ALICE WINZER and WILLIAM PRAGER
47—A-7	A Numerical Solution for the Torsion of Hollow Sections, by EDWARD C. COLIN, JR.
47—A-8	Deflections and Moments of a Rectangular Plate Clamped on All Edges and Under Hydrostatic Pressure, by EZRA G. ODLEY
47—A-9	Vibration of a Beam With Concentrated Mass, Spring, and Dashpot, by DANA YOUNG
47—A-11	Critical Shear Stress of Plates Above the Proportional Limit, by GEORGE GERARD
47—A-12	Effect of Bending Rigidity of Stringers Upon Stress Distribution in Reinforced Monocoque Cylinder Under Concentrated Transverse Loads, by ROBERT S. LEVY
47—A-13	Approximate Solutions for Symmetrically Loaded Thick-Walled Cylinders, by C. W. MACGREGOR and L. F. COFFIN, JR.
47—A-14	Mechanical Activation—A Newly Developed Chemical Process, by M. C. SHAW
47—A-15	Effect of a Concentric Reinforcing Ring on Stiffness and Strength of a Circular Plate, by WILLIAM A. NASH
47—A-16	The Mechanics and Thermodynamics of Steady, One-Dimensional Gas Flow, by A. H. SHAPIRO and WILLIAM R. HAWTHORNE
47—A-17	Buckling of Transverse Stiffened Plates Under Shear, by TSUN KUEI WANG
47—A-21	Stresses in a Notched Strip Under Tension, by CHIH-BING LING
47—A-29	Large Displacements With Small Strains in Loaded Structures, by H. SWAINGER
47—A-35	The Bending of Symmetrically Loaded Circular Plates of Variable Thickness, by H. D. CONWAY
47—A-36	The Flutter of a Uniform Wing With Tip Weights, by MARTIN GOLAND and Y. L. LUKE
47—A-52	A Mechanical Analyzer for the Solution of Vibration Problems of a Single Degree of Freedom, by E. E. WEIBEL, N. M. COKYUCEL, JR., and R. E. BLAU
47—A-53	Vibration of a Nonlinear System During Acceleration Through Resonance, by R. B. MEUSER and E. E. WEIBEL
47—A-121	Generalized Thermodynamics of High-Temperature Combustion, by HOYT C. HOTTEL, G. C. WILLIAMS, and C. N. SATTERFIELD

Paper No.	*Title and Author*
	AVIATION
47—A-19	An Aircraft Gas Turbine for Propeller Drive, by ALAN HOWARD and C. J. WALKER
	EFFECT OF TEMPERATURE ON METALS
47—A-74	Some 1000-F Steam-Pipe Materials, by ERNEST L. ROBINSON
	FLUID METERS
47—A-54	Oscillating Piston Meters for Fuel Consumption in Aircraft, by CHARLES S. HAZARD
47—A-62	High-Pressure Gas Measurement, by E. E. STOVALL
	FUELS DIVISION
47—A-22	Furnaces for By-Product Fuels, by OTTO DE LORENZI
47—A-25	High-Output Combustion of Ethyl Alcohol and Air, by A. H. SHAPIRO, D. RUSH, W. A. REED, D. G. JORDAN, and GEORGE FARNELL
47—A-27	The Influence of Reaction Interface Extension in the Combustion of Gaseous-Fuel Constituents, by W. J. WOHLENBERG
47—A-33	Ignition and Flame Stabilization in Gases, by BERNARD LEWIS and GUENTHER VON ELBE
47—A-34	Mechanisms of Combustion and Their Relation to Oil-Burner Design, by HAROLD R. HEIPLE, SR., and WILLIAM A. SULLIVAN, SR.
47—A-40	Synthetic Liquid Fuels in the United States, by W. C. SCHROEDER
47—A-47	Regional Standards for Locomotive Fuel, by E. C. PAYNE
47—A-48	Locomotive Firebox and Boiler Performance, by F. D. MOSHER
47—A-49	Better Locomotive-Servicing Facilities on the Norfolk and Western Railway, by C. E. POND
47—A-50	Intensive Utilization of Coal-Fired Steam Locomotives, by E. L. JOHNSON
47—A-51	Developments and Trends in Coal-Burning Locomotives, by CHARLES KERR, JR.
47—A-117	Experimental Combustion of Pulverized Coal at Atmospheric and Elevated Pressures, by H. R. HAZARD and F. D. BUCKLEY
	GAS-TURBINE POWER
47—A-23	Temperature Measurements and Combustion Efficiency in Combustors for Gas-Turbine Engines, by WALTER T. OLSON and EVERETT BERNARDO
47—A-28	Axial-Flow Compressors for Gas Turbines, by A. I. PONOMAREFF
47—A-32	Gas-Turbine Plant Combustion-Chamber Efficiency, by A. L. LONDON
47—A-58	The Determination of Gas-Turbine Combustion-Chamber Efficiency by Chemical Means, by PETER LLOYD
47—A-60	A Design Method for Counterflow Shell-and-Tube Heat Exchangers for Gas Turbines, by D. G. SHEPHERD
47—A-72	Analysis of Compressor Design, by A. J. JADOT

Paper No.	*Title and Author*
47—A-81	A Method of Correlating Axial-Flow Compressor Cascade Data, by HUNT DAVIS
47—A-83	High-Performance Surfaces for Gas-Turbine-Plant Regenerators, by A. L. LONDON and C. K. FERGUSON
47—A-104	Heat Exchanger Tube-Sheet Design, by KARL A. GARDNER
	HEAT TRANSFER
47—A-63	Heat Transfer Through Thick Insulation on Cylindrical Enclosures, by T. S. NICKERSON
47—A-91	Condensation of Refrigerant Vapors—Apparatus and Film Coefficients for Freon-12, by ROBERT E. WHITE
47—A-96	Condensation on Six Finned Tubes in a Vertical Row, by D. L. KATZ and J. M. GEIST
47—A-97	Flash Drying of Materials by a New Method, by CHARLES W. GORDON
47—A-102	Heat Transfer and Fluid Friction During Viscous Flow Across Banks of Tubes, by GEORGE A. OMOHUNDRO, A. P. COLBURN, and O. P. BERGELIN
47—A-103	A Study of Flow Patterns in Baffled Heat Exchangers, SIGMUND KOPP, H. R. SENNSTROM, and A. Y. GUNTER
47—A-105	The Effect of Baffle Height and Baffle Clearance on Heat Transfer and Pressure Drop in Heat Exchangers, by B. E. SHORT
47—A-113	Prediction of Pressure Drop During Forced-Circulation Boiling of Water, by R. C. MARTINELLI and D. B. NELSON
47—A-130	Shell Side Heat-Transfer Characteristics of Segmentally Baffled Shell-and-Tube Heat Exchangers, by TOWNSEND TINKER
	HEATING VALUES OF FUELS
47—A-123	Current Definitions of High- and Low-Heat Values of a Fuel and Current Methods for Their Determination, by E. F. FIOCK, RALPH H. JESSUP, and FILLMER W. RUEGG
47—A-123	Current Definitions of Thermal Efficiencies and Current Usage of Observed Fuel Heat Values and Consumption Test Data for the Evaluation of Thermal Efficiencies Reported for (a) Steam and (b) Internal-Combustion Power Plants, by A. G. CHRISTIE
47—A-123	Discussion of Procedures for Evaluating Energy, Temperature, and Pressure Relations Based on Precise Knowledge of Thermodynamic Properties of the Gases Resulting From the Combustion of Fuel in Thermal Devices, Including Gas Turbines, by R. V. KLEINSCHMIDT
	HYDRAULICS
47—A-93	Hydraulic Problems in Connection With the Design of the Granby Pumping Plant, by ELIOT B. MOSES
47—A-112	The Hydrodynamics Laboratory at the California Institute of Technology, by R. T. KNAPP, JOSEPH LEVY, F. BARTON BROWN, and J. PAT O'NEILL
47—A-116	Pumping Requirements for Irrigation on Columbia Basin and Central Valley Projects of the Bureau of Reclamation, by IRVING L. WIGHTMAN
	INDUSTRIAL INSTRUMENTS AND REGULATORS
47—A-37	Development of an Air-Operated Force-Measuring System by A. A. MARKSON and RAY S. WILLIAMS
47—A-38	Continuous Determination of Oxygen Concentration Based on the Magnetic Properties of Gases, by ROBERT D. RICHARDSON
47—A-67	Electrical System for Aircraft Flowmeters, by ROBERT G. BALLARD
47—A-70	Frequency-Response Measurements of a Hydraulic Power Unit, by M. RUSSELL HANNAH
47—A-120	Stability of SR-4 Electric Strain Gages and Methods for Their Waterproofing and Protection in Field Service, by ALEXANDER BOODBERG, E. D. HOWE, and BERNARD YORK

Paper No.	*Title and Author*
	LUBRICATION
47—A-18	Studies in Boundary Lubrication II—The Influence of Adsorbed Moisture Films on the Coefficient of Static Friction Between Lubricated Surfaces, by W. E. CAMPBELL and E. A. THURBER
47—A-61	Measurements of the Combined Frictional and Thermal Behavior in Journal-Bearing Lubrication, by S. A. MCKEE and J. F. SWINDELLS
47—A-114	High-Temperature Performance of Silicone Fluids in Journal Bearings, by J. E. BROPHY, JOHN LARSON, and R. O. MILITZ
47—A-122	The Hydrosphere—A New Hydrodynamic Bearing, by M. C. SHAW and CHARLES D. STRANG, JR.
	MACHINE DESIGN
47—A-41	Development of a High-Speed Lathe for Machining Aluminums, by R. L. TEMPLIN
47—A-42	Ball-Bearing Slides, by CONRAD JOBST
47—A-46	An Analysis of the Dynamic Forces in a Cam-Driven System, by J. A. HRONES
47—A-76	Electrification Increases Productivity of Small Turret Lathes, by ROBERT H. CLARK
47—A-77	Curvature-Acceleration Relations for Plane Cams, by M. L. BAXTER, JR.
47—A-98	Introduction to Panel-Design for Production, by GEORGE G. LANDIS
47—A-99	Co-Ordination of Design and Manufacture in the Transportation and Generator Division of Westinghouse, by P. C. SMITH
47—A-100	Product Design for Economical Manufacture, by L. M. CLEMENT
	MANAGEMENT
47—A-56	Some Engineering Aspects of Quality Control, by A. G. DALTON
47—A-57	Predesign Research as Applied to Product Development, by ROGER L. NOWLAND
47—A-64	User Research as a Tool in Developing New Industrial Products, by ERNST E. WACHSMUTH
47—A-84	Joint Training Course in Labor Relations Conducted by Botany Mills, Inc., and Textile Workers Union of America (C.I.O.), by IRVING J. PHILLIPSON
47—A-111	Modern Quality Control, by SIMON COLLIER
	MATERIALS HANDLING
47—A-24	Co-Ordinating Materials Handling With the Manufacturing Cycle, by S. C. HOEY
47—A-94	Materials Handling in the Distribution Department of the Telephone Division of the Western Electric Company, by F. C. PODBOY
	METALS ENGINEERING
47—A-10	Effect of Some Processing Variables on the Stresses Required to Draw Tubular Parts, by GEORGE ESPEY and GEORGE SACHS
47—A-20	Strength and Failure Characteristics of Thin Circular Membranes, by W. F. BROWN, JR., and GEORGE SACHS
47—A-59	Notes on the Design and Construction of Staybolted Locomotive Fireboxes, by F. P. HUSTON
47—A-75	Development of Cleavage Fractures in Mild Steels, by A. B. BAGSAR
47—A-88	Magnesium Castings, Their Production and Use, by M. E. BROOKS and A. W. WINSTON
	OIL AND GAS POWER
47—A-43	The Universal Optimum Power Cycle for Elastic Fluid Turbine Power Plants, by JOHN KREITNER and FREDERICK NETTEL

Paper No.	*Title and Author*
47—A-69	Discussion of Transmission Systems for Marine Propulsion of Gas-Turbine Power Plants, by W. E. HAMMOND
47—A-108	The Removal of Aldehydes From Diesel Exhaust Gas, by ROGERS F. DAVIS and M. A. ELLIOTT
47—A-124	Problems Associated With the Use of Diesel Fuels, by W. L. H. DOYLE and E. W. LANDEN
	PETROLEUM
47—A-39	Proposed Recommended Practices for the Preparation of New Turbine Lubricating Systems. Report presented by F. E. ROSENSTIEHL
	POWER DIVISION
47—A-86	Low-Pressure Steam-Heated Marine Distilling Plants, by A. M. IMPAGLIAZZO and ROBERT M. BENT
47—A-87	The 2000 Psi, 1050 F, and 1000 F Reheat Cycle at the Philip Sporn and Twin Branch Steam-Electric Stations, by PHILIP SPORN
47—A-90	Oil Elimination From Feedwater, by MORRIS BRADT
47—A-109	Nuclear Engineering—Basic Design Background, by JOHN R. HUFFMAN
47—A-110	A Subsaturation Reheat Cycle, by W. E. CALDWELL
47—A-119	An Experimental Determination of Sound in Superheated Steam by Ultrasonics, by JAMES WOODBURN
	PROCESS INDUSTRIES
47—A-66	Why Pollution Abatement Concerns the Mechanical Engineer, by J. RAYMUND HOFFERT
	PRODUCTION ENGINEERING
47—A-65	A Discussion of Modern Quality-Control Techniques, by C. W. KENNEDY
47—A-131	A Recent Development in Automatic Lathe Control, by E. P. BULLARD, III
47—A-132	A Clinical Approach to Weldment Design, by GERALD VON STROH
	RAILROADS
47—A-71	Freight-Car Truck Progress, by R. B. COTTRELL
47—A-73	Pennsylvania Railroad 2000-Hp Streamlined Diesel Road Locomotive, by J. C. MACINNES
47—A-78	Development and Trend in the Design of Hopper-Discharge Types of Railway Cars, by GEORGE A. SUCKFIELD
47—A-79	Weight Reduction—Freight Cars, by ROBERT B. BORUCKI and E. A. SIPP
47—A-82	Streamlining Effect on Air Resistance and Smoke Lifting on Steam Locomotives, by J. F. GRIFFIN
47—A-89	Freight-Car Construction, by G. B. HAUSER
47—A-106	Weight Reduction—Freight Cars: The AAR Standard Air Brake—AB Single-Capacity Freight-Brake Equipment, by H. NORTON SUDDUTH
47—A-107	Economics of Application of High-Strength Steel in Freight Cars, by A. F. STUEBING
47—A-118	Coal-Burning Gas-Turbine Locomotives, by JOHN I. YELLOTT, P. R. BROADLEY, and CHARLES F. KOTTCAMP
47—A-128	Opportunities in Freight-Car Design, by S. M. FELTON
47—A-129	The Effect of Foundation Brake Equipment on Emergency-Stop Distances, by C. D. STEWART
	RUBBER AND PLASTICS
47—A-101	Plastic Tooling Comes of Age, by LAWRENCE WITTMAN
47—A-125	Rubber in the Automotive Industry, by ROBERT K. WILLIAMS
	SAFETY
47—A-30	Integrating Safety Engineering in the Engineering College Curricula, by H. W. HEINRICH
47—A-31	Personal Factors for Developing Safety Consciousness, by WALTER A. CUTTER
47—A-55	Using Operations Analysis Procedures for Accident Prevention, by JOHN V. GRIMALDI
	WOOD INDUSTRIES
47—A-26	High-Frequency Molding: Method Applied to Compound Curvatures in Wood, by P. H. BILHUBER
47—A-44	Factory Layout and Equipment for the Mass Production of Molded Plywood Furniture, by E. SIGURD JOHNSON
47—A-45	Integrated Forest Utilization in the Pacific Northwest, by O. HARRY SCHRADER, JR.
47—A-68	Laminating for Small-Boat Construction, by DONALD F. MAY
47—A-85	Results of Accelerated Tests and Long-Term Exposures on Glue Joints in Laminated Beams, by T. R. TRUAX and M. L. SELBO
47—A-92	Wetting Agents in Forestry Fire Fighting, by HUGH N. McNAIR and J. J. DUGGAN
47—A-115	Radio-Frequency Heating in the Woodworking Industry, by FRANCIS L. MACALUSO
47—A-127	Performance Characteristics of Tight White Oak Laminated-Stave and Solid-Stave Barrels, by R. S. KURTENACKER and D. L. PATRICK
	AMERICAN ROCKET SOCIETY
47—A-80	Thermochemistry of Rocket Propellants, by GEORGE P. SUTTON

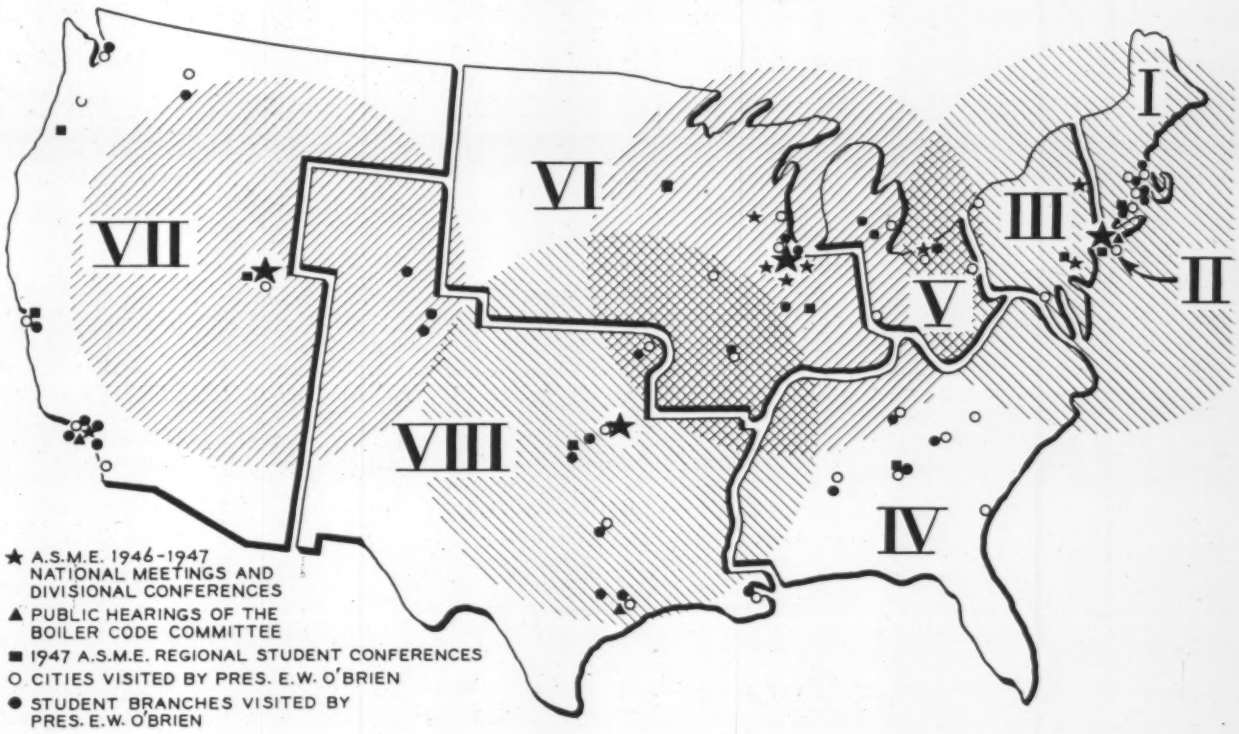
Coupon Books for Ordering ASME Papers

To facilitate the ordering of preprints and reprints of ASME papers, Coupon Books are now available to members at $2.00 and $4.00 each (to nonmembers at $2.50 and $5.00). The Coupon Book selling at $2.00 contains 10 coupons, each having a value of 25¢; that priced at $4.00 contains 20 coupons, each of which is also valued at 25¢.

Coupons are dated December, 1947, and will be valid to December 31, 1948. They are not redeemable nor can they be used to purchase other ASME publications.

Single copies are priced at 25 cents to members, 50 cents to nonmembers.

WHERE MAJOR A.S.M.E. ACTIVITIES WERE HELD IN 1946-47



DURING THE YEAR, MAJOR A.S.M.E. EVENTS WERE HELD IN THE INDUSTRIAL CENTERS OF THE NATION

(Shaded areas around the four national-meeting cities demonstrates the A.S.M.E. policy of holding each year at least one national meeting within one-day travel time from the home communities of most A.S.M.E. members.)

To A.S.M.E. Members:

THE COUNCIL REPORTS *for* 1947

ACTIVITIES of The American Society of Mechanical Engineers that are under the jurisdiction of the Council are reported to it annually by standing and special committees, boards, and Society representatives on other bodies. These reports are available to members on request. The report of the Council to the members merely summarizes the high lights of these numerous and more extensive reports.

Emphasis in this report is placed on three categories of Society activity: Accomplishments of national and professional significance; participation in international affairs; and general Society activities. Mention is made of some major changes in Society organization and program and of its financial position. In spite of rapidly rising costs, the Society closed its fiscal year with a favorable balance of income over expenses as a result of income derived from dues of new members, from advertising, and from publication sales.

No attention is paid in this report to technological advances, which reached a high peak during the year and were made public through the Society's meetings, professional divisions, publications, and the reports of its research and other technical committees. Such a summary of technological progress is obviously impracticable in this report. Nor is it possible to assess the contributions to the technological life of the nation that were made by the Society's 71 sections, its 123 student branches, and its individual members. The Council gratefully acknowledges the efforts of the many members which have gone into all such contributions.

I NATIONAL AND PROFESSIONAL ACCOMPLISHMENTS

Accomplishments of broad national and professional significance were secured directly by Society Committees and indirectly through the Engineers Joint Council, a body made up of the presidents, junior past-presidents, and secretaries of five engineering societies.[1]

[1] The American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Institute of Chemical Engineers.

ENGINEERING LITERATURE PUBLISHED BY THE A.S.M.E. DURING 1947

LEGISLATION

Labor legislation affecting engineers was a matter of immediate concern during the year. The Society was represented on a panel organized by Engineers Joint Council that appeared before labor committees of the Congress. To secure information about members' opinions as an aid to the panel, a questionnaire was sent to the members. The conclusions as of that date were:

1 The membership was overwhelmingly opposed to the then existing National Labor Relations Act (Wagner Act) as it affected professional employees.

2 Approximately 75 per cent of the total A.S.M.E. membership favored complete exclusion of professional employees from national labor legislation, but a substantial minority, particularly of younger men, preferred to retain the right to bargain collectively, provided it could be done at their own choice and in a professional manner.

The E.J.C. panel was successful in introducing provisions into the Taft-Hartley Labor Law by which employed professional people will have their professional rights protected.

COLLECTIVE BARGAINING

To aid engineers, A.S.M.E. joined with E.J.C. in publishing a manual[2] on collective bargaining. This manual was based on the Wagner Act, and if revision is demanded, it must be modified to take account of the Taft-Hartley Law.

EMPLOYER PRACTICE

An important report[3] on employer practice regarding engineering graduates was issued in April, 1947, by a subcommittee of E.J.C., headed by E. G. Bailey, now president-elect, A.S.M.E. This report was based on a survey which had as its objective "to learn directly from industrial employers their attitudes and policies pertaining to the selection, training, placement, advancement, guidance and professional activities of engineering-graduate employees." Obviously, this is a matter of prime importance to engineers, particularly the younger men.

The report summarized responses from 104 employers in 19 industrial, utility, and educational fields which employed about 40,000 engineers. The data in the report are highly significant but the Committee concluded that a larger coverage of industry should be made. This will be done during 1948. Of particular significance is the fact that 60 per cent of the employers addressed replied to the questionnaire. The results showed that the average starting salary for graduates was $207; that 42 per cent of the executives and 37 per cent of the officers of these companies are engineering graduates. Eighty per cent of the responders indicated the engineer's role in the development of the company as "very important." It was estimated that these companies would need 23 per cent more engineers in 1950 than in 1946.

EARNINGS STUDY

In September, 1947, the report of the E.J.C. Committee on Economic Status was issued as a pamphlet of 94 pages entitled "The Engineering Profession in Transition."[4] This report, packed with significant data, represents the analysis of approximately 37,000 usable questionnaires received from members of the five societies participating in E.J.C., and the National Society of Professional Engineers. It shows earnings for 1939, 1943, and 1946 according to type of employment, education, and geographical location. It provides an important factual guide for the future study of economic-status problems of the engineering profession.

WAR EXPERIENCE SURVEY

Both the War Department and the Engineering Societies are interested in the degree to which engineering skills were utilized during the recent war. Accordingly, a survey of member experience in war activities was made by the A.S.M.E. and the questionnaires were turned over to the War Department for tabulation. Presumably, we shall have a report on this in the near future.

[2] "Manual on Collective Bargaining for Professional Employees," Part 1, The National Labor Relations Act and Professional Employees, published by The Committee on the Economic Status of the Engineer, Engineers Joint Council, 1947, New York, N. Y.

[3] "Employer Practice Regarding Engineering Graduates—Report of Preliminary Survey," MECHANICAL ENGINEERING, vol. 69, no. 4, April, 1947, pp. 306–308.

[4] "The Engineering Profession in Transition," by William N. Carey, MECHANICAL ENGINEERING, vol. 69, no. 9, September, 1947, pp. 732–734.

ORGANIZATION OF PROFESSION

E.J.C. is making a careful study of the organization of the engineering profession and during the year reached the conclusion that the bringing together of engineers in the community is an important factor in engineering organization. A report recommending the establishment of local councils of engineers was accepted by the A.S.M.E. and distributed to the Sections with the recommendation that such Councils or some similar suitable local organization be established where not now in existence. Sections of the Society were urged to give their wholehearted support to such an activity.

PROFESSIONAL STATUS

The Engineers' Council for Professional Development published a fifteen-year report which summarized the accomplishments of E.C.P.D. and revealed its plans for the future. E.C.P.D. made further progress during the year in developing measurement techniques for the testing of prospective engineering students. This test, originated in 1943 and administered to more than 40,000 persons, will soon be extended to preparatory-school students in the tenth grade. Its purpose is to improve the education and selection processes with possible subsequent improvement in the engineering profession. Reinspection of the curricula of engineering schools and technical institutes was resumed during the year. E.C.P.D. adopted Canons of Ethics for Engineers and submitted them to the participating bodies for approval. A.S.M.E. Council has given such approval.

II INTERNATIONAL ACTIVITIES

In international matters, the Society's activities were carried on both through participation in the Joint Committee on International Relations of E.J.C. and directly by the Society officers and committees.

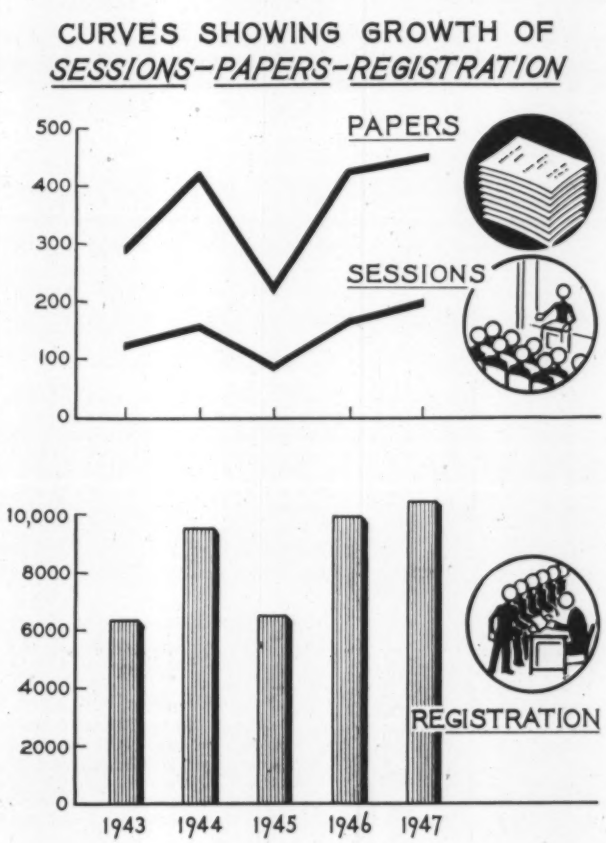


CHART REFLECTS CONTINUING GROWTH OF THE A.S.M.E.
(The ban on railroad travel during 1945 caused cancellation of many meetings.)

The Engineers Joint Council was chosen as one of the member bodies of the U. S. Commission on the United Nations Educational, Scientific, and Cultural Organization (UNESCO). Under the E.J.C. the A.S.M.E., jointly with the A.S.C.E. and A.I.Ch.E., participated in the U. S. National Commission to organize American participation in a World Engineering Conference, which, among other useful international functions, will serve as a contact between the engineering profession throughout the world and the headquarters office of UNESCO. American representatives attended the Executive Committee meeting of the World Engineering Conference in Zurich during September 1947.

In 1947 a quarterly publication called *Adelantos de Ingenieria* was developed for distribution to selected engineers in Latin-American countries. This quarterly was made up of papers and other related matter selected from the publications and journals of the societies participating in E.J.C. The enthusiasm with which it has been received indicates the desirability of the continuance of the journal on a self-supporting basis.

Under E.J.C. auspices large quantities of books were collected from individual members of the profession and distributed to the libraries of devastated countries.

The A.S.M.E. has met and been of service to many distinguished engineers from over seas. It has contributed to and was represented at two important centennials, those of The Institution of Mechanical Engineers in London and the Royal Society of Engineers in Holland.

For the Eighth International Management Congress in Stockholm in July, A.S.M.E. members contributed 22 papers to the program. Twelve members of the Society attended the Congress.

Agreement was reached on active co-operation between the Society and the Belgian National Research Council through which it is hoped that in due course valuable interchange of engineering experience will result.

Active co-operation with The Engineering Institute of Canada was carried on under the agreement made between the two Societies in 1945. The Institute participated in two A.S.M.E. meetings and several Canadians were appointed to A.S.M.E. committees. A representative of the A.S.M.E. Ontario Section was added to the Council of The Engineering Institute of Canada.

In co-operation with five other societies and two foreign societies, the A.S.M.E. inaugurated a new journal called *Applied Mechanics Reviews*. Of particular significance internationally, this journal will make available each month a critical review of the world literature in applied mechanics. Lloyd H. Donnell, of the Illinois Institute of Technology, was selected as editor in August, 1947. The first issue is expected during January, 1948.

The Calvin W. Rice Memorial Scholarship of the Woman's Auxiliary was awarded to Dr. V. Zebehely, of Budapest, Hungary.

III SOCIETY ACTIVITIES

Society activities were carried on at an advanced pace during the year.

MEETINGS

Thirteen national meetings and Division Conferences attracted an attendance of 10,492 (see Table 1). The general theme of the national meetings, the Public Responsibility of the Engineer, was treated in important addresses and by committees. The Tulsa and Salt Lake City meetings featured the

TABLE 1

Meetings	Number of sessions	Number of papers	Attendance
Petroleum Committee (Process Industries Division) Tulsa, Okla., Oct. 7 to 9, 1946	18	37	350
Fuels Div. (with A.I.M.E. Coal Division) Philadelphia, Pa., Oct. 24–25, 1946	3	8	312
1946 Annual Meeting New York, N. Y., Dec. 2 to 6	73	200	5166
Spring Meeting Tulsa, Okla., March 2 to 5, 1947	13	23	349
Oil and Gas Power Division Cleveland, Ohio, May 21 to 24	7	14	400
Aviation Division Los Angeles, Calif., May 26 to 29	27	37	1500
Wood Industries Division Madison, Wis., June 12–13	3	10	110
Semi-Annual Meeting Chicago, Ill., June 16 to 19	32	69	1295
Applied Mechanics Division Schenectady, N. Y., June 23 to 25	6	23	130
Fall Meeting Salt Lake City, Utah, Sept. 1 to 4	9	18	140
Production Engineering—Machine Design (Participation in Machine Tool Congress) Chicago, Ill., Sept. 18, 1947	1	2	175
Production Engineering—Research Committee on Metal Cutting Data—Bibliography (Participation in Machine Tool Congress) Chicago, Ill., Sept. 24, 1947	1	2	225
Industrial Instruments and Regulators Division Chicago, Ill., Sept. 8–9	2	5	340
	195	448	10,492

industrial potentialities of the southwest and intermountain areas.

Seventy-one sections held 645 meetings, an increase of 91 over the previous year. Two sections held particularly noteworthy meetings: Pittsburgh devoted a full day to a mechanical-engineering conference; a Detroit meeting, addressed by the governor of Michigan, was featured by the bestowal of Fellow certificates on fifteen distinguished members in that area.

PUBLICATIONS

At national and Divisional meetings, 448 papers were presented. In Transactions, the *Journal of Applied Mechanics*, and MECHANICAL ENGINEERING, 240 papers presented at meetings were published.

Thirty-two special publications were issued. These included eight Sections of the A.S.M.E. Boiler Code, twelve standards under the procedure of the American Standards Association, an autobiography of past-president Mortimer E. Cooley, and the report on the earnings of engineers entitled, "The Engineering Profession in Transition."

The increases in publication costs, in number of papers presented, and in diversity of technical interest in the Society led to the formulation of a new publication plan which was submitted to the members for letter ballot as the year closed.

JUNIORS

Early in 1947, a Junior Committee was organized, with a junior member as chairman, to recommend steps for the Society to take to help junior engineers. The Committee prepared a ten-point program of activities to be carried out in A.S.M.E. sections under the leadership of the vice-presidents. A "Junior Forum" was started in MECHANICAL ENGINEERING for the discussion of junior problems and activities.

PROFESSIONAL DIVISIONS

Two new divisions, Machine Design and Gas Turbine Power, were organized during the year.

STUDENTS

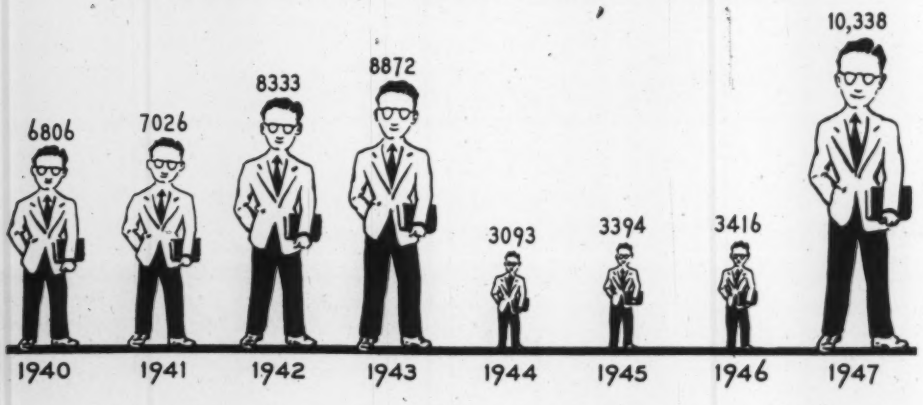
Persons enrolled as Student Members numbered 10,338 as compared to 3416 in the previous year and 8872 in 1943, the largest previous year; 437 student-branch meetings were held; and 11 regional student conferences attracted an attendance of more than 1300. A new student branch was installed at Wayne University, making the total 123.

RESEARCH

The Research Committee entered upon a revitalized research program.[5] A special research committee on Fatigue Strength of Screw Threads was organized to sponsor a research program in relation to the joint American-British and Canadian project to standardize screw threads.

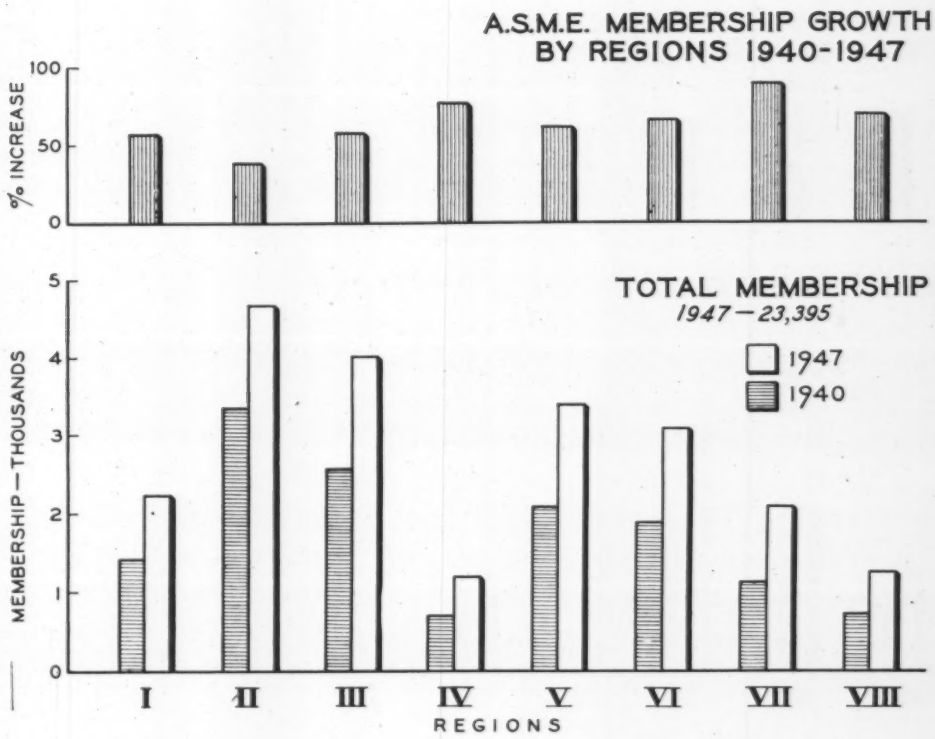
[5] "Postwar Design for A.S.M.E. Research," by Robert A. O'Brien, MECHANICAL ENGINEERING, vol. 69, no. 2, February, 1947, pp. 145–146.

A.S.M.E. STUDENT MEMBERS
(EQUIVALENT FULL-YEAR STUDENT MEMBERS)



STUDENT ENROLLMENT IN THE A.S.M.E. BROKE RECORDS IN 1947

(The growth curve, established in the early years of the war and interrupted at the height of American participation, was resumed in 1947.)



GROWTH OF THE A S M.E. BY REGIONS BETWEEN 1940 AND 1947
(It reflects increasing industrialization of the South and Far West.)

STANDARDS AND CODES

Progress was made in a revision of screw-thread standards, an important contribution to the international screw-thread-standards project. Twelve standards were published under the A.S.A. procedure.

The eight sections of the Boiler Construction Code were revised and republished. A proposed draft of a new Unfired Pressure Vessel Code was submitted to public hearing at Houston, Texas, and Los Angeles, Calif. Certificates of Authorization for the use of the Code symbol stamp were issued to 1500 manufacturers. The Boiler Code Committee accepted responsibility in connection with a proposed international Code.

An important novel contribution was made by the Safety Committee in the form of an A.S.M.E. standard for appraising the safety measures in effect in individual industrial plants.

The Power Test Codes Committee completed a comprehensive review of the present status of the Power Test Codes and a program for their revision.

LIBRARY

The Engineering Societies Library served 23,000 callers and 15,000 requests by mail or telephone. Seven thousand books and pamphlets were added to the collection.

CIVIC RESPONSIBILITY

A manual to aid sections and student branches in stimulating greater participation in civic affairs was issued by the Engineers Civic Responsibility Committee.

IV ADMINISTRATION AND ORGANIZATION

VICE-PRESIDENTS, REGIONAL

This was the second year of operation of the plan under which the Vice-President selected by each Region exercised responsibility for the work of the Sections and Branches in his Region. The plan is proving useful in bringing the problems of the sections and branches to the Council and in giving their work increased impetus.

BOARDS AND COMMITTEES

The By-Laws were changed to place the activities of the Society under four committees, Finance, Organization, Library, and Constitution and By-Laws, and six boards, to which the Council delegated some portion of its responsibility. Three boards were fully organized and operating during the year, Honors, Technology, and Codes and Standards. The other boards, on Membership, Public Affairs, and Education and Professional Status,

TABLE 2 CHANGES IN MEMBERSHIP

(Sept. 30, 1946 to Sept. 30, 1947)

	Membership		Increases			Decreases				Changes		
	Sept. 30, 1947	Sept. 30, 1946	Transferred to	Elected	Reinstated	Transferred from	Resigned	Dropped	Died	Increases	Decreases	Net change
Honorary members	46	41	3	2	...	...	...	...	...	5	...	+ 5
Fellows	229	192	52	1	...	3	1	...	12	53	16	+ 37
Members	10944	10379	234	567	163	51	143	59	146	964	399	+ 565
Associates	359	305	5	67	5	4	6	7	6	77	23	+ 54
Junior (20)	2710	2548	433	79	41	134	177	75	5	553	391	+ 162
Junior (15)	2304	2029	825	157	27	529	147	56	2	1009	734	+ 275
Junior (10)	6803	6042	...	2045	69	831	421	92	9	2114	1353	+ 761
Total membership	23395	21536	1552	2918	305	1552	895	289	180	4775	2916	+1859

were organized but did not request specific delegation of responsibility.

The Organization Committee, established in 1945, continued its efforts to improve the method of selecting committees and committee members and promulgated a manual of policy and procedure.

MEMBERSHIP

The Membership of the Society reached 23,395 at the end of the year, a new high (see Table 2).

The membership Development Committee was organized with representatives of the eight regions and started an active program.

Changes in the Constitution designed to clarify the provisions for the Fellow grade were submitted to letter ballot as the year drew to a close.

THE COUNCIL

The Council met twice, at New York, N. Y., in December and at Chicago, Ill., in June. The vice-presidents met at New York, N. Y., in December, at Tulsa, Okla., in March, and at Chicago, Ill., in June. The Executive Committee met eleven times.

The President visited 46 sections and 52 student branches, traveling more than 40,000 miles.

The deaths of Alex. R. Stevenson, Jr., and B. V. E. Nordberg left vacancies in the Council which were filled by N. E. Funk and L. K. Sillcox.

WOMAN'S AUXILIARY

The Woman's Auxiliary with a membership of 391 has five active local sections, New York, Chicago, Cleveland, Philadelphia, and Los Angeles. A new section is being formed in Milwaukee.

DEATHS

Among the members of the Society who died during the year were Henry Ford, Fellow, A.S.M.E., and William Elmer, Fellow, A.S.M.E., former member of the Council.

SECRETARY'S OFFICE

During the year Ernest Hartford completed 35 years of service with the Society, Jean Brown 30 years, and Ivah Martin, Genevieve Wood, and Kathryn Kemmer 25 years.

O. B. Schier was added to the staff as meetings and divisions assistant, R. A. O'Brien as research assistant, P. H. Sullivan and T. H. Currier as standards and codes assistants, and S. E. Reimel in the Secretary's office. J. W. Shields resigned as standards and codes assistant to become professor of mechanics at the University of Delaware.

COUNSEL

The firm of Carter, Ledyard & Milburn was selected as Counsel for the Society.

V FINANCES[6]

The income of the Society for the year, including initiation fees, exceeded a million dollars, the largest income in the history of the Society. The policy of the Council was to use the income of the Society for service to the members. A net income over expense of $6905.15 is reported. This amount plus initiation and transfer fees amounting to $26,030, make a total addition to surplus from income for the year of $32,935.

[6] The certified report of the auditors, Price, Waterhouse & Co., is on file in the Society office and available for inspection by the members.

The Balance Sheet of September 30, 1947, shows, on that date, that the Society owed:

(1) Current bills and federal tax withheld from employees	$ 9,879.25
(2) Obligations for printing and distributing the 1948 Mechanical Catalog and other bills which have not been submitted	36,163.86
(3) Unexpended appropriations for future services	105,300.58
(4) Special research and other committees which have collected funds for special purposes to be expended as needed	90,729.26
(5) Future services to members who have prepaid dues	123,279.09
(6) Subscribers to publications who have prepaid	4,000.00
	$369,352.04

To meet these debts the Society had:

(1) Cash in the bank	$ 88,474.87
(2) Accounts receivable	122,112.44
(3) Inventories of publications and supplies conservatively valued at	40,098.06
(4) Securities (at the lower of cost or approximate quoted market values)	682,394.46
	$933,079.83

The difference between the value held by the Society of $933,079.83 and debts of $369,352.04, is the net worth of Society on September 30, 1947, $563,727.79, of which $500,000.00 has been set aside as a General Reserve against Contingencies, leaving a balance of ..... $ 63,727.79

The Society had other liabilities:

(1) Development Fund of		$103,387.77
Against which it had		
(a) Cash	$ 15,286.21	
(b) Securities (at the lower of cost or approximate quoted market values)	88,101.56	
	$103,387.77	
(2) Employees' Retirement Fund of		$123,032.68
Against which it had		
(a) Cash	$ 6,435.65	
(b) Securities (at the lower of cost or approximate quoted market values)	116,597.03	
	$123,032.68	
(3) Trust Funds amounting to		$153,554.71
Against which the Society had the following assets:		
(a) Cash	$ 8,523.80	
(b) Note receivable	150.00	
(c) Securities (at the lower of cost or approximate quoted market values)	144,880.91	
	$153,554.71	
(4) Property Fund of		$545,641.10
With the following assets to support it:		
(a) Quarter interest in building	$498,448.48	
(b) Office furniture and fixtures (depreciated value)	47,190.62	
(c) Library books	1.00	
(d) Engineering Index, Inc.—Title and good will	1.00	
	$545,641.10	

Table 3 shows the income and expense for the major groupings of Society activities. Table 4 shows the activities which produce an income and those which result in a net expense.

TABLE 3 INCOME AND EXPENSE FOR MAJOR GROUPS OF SOCIETY ACTIVITIES

	Expense	Income	Net	Expense per member	Income per member	Net Expense per member
Dues	.....	$337,045.62	+$337,045.62	....	$14.41	....
General Income (interest, discount, emblem sales, Engineering Index)	.....	25,408.65	+ 25,408.65	....	1.08	....
					$15.49	
Publication, Standards, Codes, and Research	$632,744.50	579,872.30	— 52,872.20	$27.04	24.78	$ 2.26
General Society Activities (meetings, sections, student branches, admissions, etc.)	239,159.63	32,224.50	— 206,935.13	10.22	1.38	8.84
General Society Administration (Council, auditor, counsel, retirement fund)	57,756.94	.....	— 57,756.94	2.47	....	2.47
Joint Activities (Library, E.C.P.D., E.J.C., etc.)	37,984.85	.....	— 37,984.85	1.62	....	1.62
Addition to surplus from operating income	6,905.15	.....	— 6,905.15	.30	....	.30
Total	$974,551.07	$974,551.07		$41.65	$41.65	$15.49
Addition to surplus from initiation fees		26,030.20				1.11
Total additional to surplus		32,935.15				1.41

A.S.M.E. INCOME AND HOW IT WAS USED

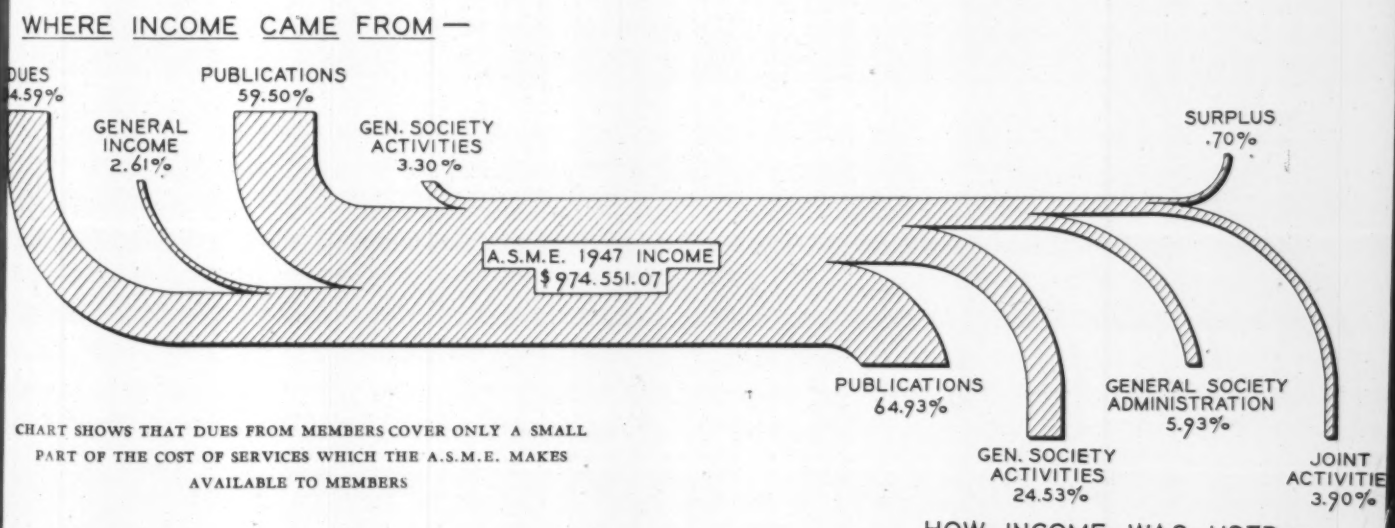


CHART SHOWS THAT DUES FROM MEMBERS COVER ONLY A SMALL PART OF THE COST OF SERVICES WHICH THE A.S.M.E. MAKES AVAILABLE TO MEMBERS

TABLE 4 INCOME AND EXPENSE OF ASME ACTIVITIES, 1946–1947

MECHANICAL ENGINEERING and Mechanical Catalog income	$390,370.50	
Less production costs, wages, and indirect	262,320.55	$128,049.95
General publication sales income	$ 64,260.92	
Less stock cost, wages, and indirect	60,338.89	3,922.03
Engineering Index		2,282.17
Miscellaneous sales		4,873.94
Interest and discount		18,252.54
Membership dues		337,045.62
Total		$494,426.25
MECHANICAL ENGINEERING text (production, wages, and indirect)		$ 82,079.58
Transactions (production, wages, and indirect)		77,771.96
Membership List (production, wages, and indirect)		10,000.00
Standards and Codes income	$120,894.81	
Stock cost, wages, and indirect	130,930.60	10,035.79
Research income	$ 4,346.07	
Stock cost, wages, and indirect	9,302.92	4,956.85
Student dues	$ 31,254.50	
Student expense (production, wages, and indirect)	38,572.81	7,318.31
Meetings income	$ 970.00	
Costs, wages, and indirect	53,186.26	52,216.26
Lectureships (travel)		2 000.00
Sections (appropriations, travel, wages, and indirect)		92,098.50
Divisions (appropriations, wages, and indirect)		23,379.50
Admissions and development (wages and indirect)		28,586.80
Awards (costs, wages, and indirect)		1,335.76
Joint activities		37,984.85
General administration		57,756.94
Total		$487,521.10
Net income		$ 6,905 15

ATLANTIC CITY SCENE *of* 1947 ASME ANNUAL MEETING

THREE thousand members and guests attended the Sixty-Eighth Annual Meeting of The American Society of Mechanical Engineers held at the Chalfonte-Haddon Hall, Atlantic City, N. J., Dec. 1–5, 1947.

Only infrequently during recent years has an ASME Annual Meeting been held outside New York and the Atlantic City meeting was to a certain extent an experiment. Members who attended were well pleased. Lack of competing demands for time, both of a business and a social character, swelled attendance at technical sessions and made possible entertainment features which would not have been attempted in New York. However, plans have been made to hold the 1948 meeting in New York as usual.

In harmony with the times, the principal theme running throughout the less technical sessions and discussions was the place of the engineer in the current situation in international, national, economic, and productive areas and the "accent," to borrow an expression reiterated by President O'Brien, was on youth.

Careful planning and much attention to detail on the part of the Meetings Committee, the professional divisions, and technical and other committees which contributed papers and sponsored sessions, by the general committee and its subcommittees, which arranged for entertainment, the Annual Dinner, and inspection trips, and by the committee on women's activities resulted in smoothly flowing operation for the enjoyment of members and their guests.

The program listed 74 technical sessions, 7 public luncheons, and 6 public dinners, at which more than 200 papers were presented. In addition there were scores of special luncheons, dinners, and committee meetings. As has been customary recently, the American Rocket Society contributed several sessions and sponsored one luncheon and a dinner. An educational exhibit devoted to nuclear energy, gas turbines, jet propulsion, economic principles, and graphic arts was on display throughout the entire meeting.

TECHNICAL PROGRAM

A large variety of technical material covering the latest developments and research in the field of mechanical engineering was presented at the 1947 ASME Annual Meeting. More than 200 papers on applied mechanics; heat transfer; power, fuels, and related subjects; metal cutting and production engineering; management and education; industrial instruments; rubber and plastics; materials handling; wood industries; railroads; textiles; and aviation were read at the 74 technical sessions.

Pages 38 to 40 of this issue contain a list of the preprints made available at the meeting and now on sale by ASME. The substance in brief of these preprints and other important papers is included in the following account of the technical program. Preprint numbers are given where available and the author and title of the corresponding papers may be obtained from the accompanying list. The list is arranged according to divisions. Pamphlet copies of preprints included in the list are available from ASME Publications Sales Department, 29 West 39th St., New York 18, N. Y. In ordering give title, author, and paper number. State number of copies wanted. Price 25 cents per copy to ASME members.

AVIATION

The design of an engineering laboratory with full-scale development test facilities for compressor, combustor, turbine, and all accessory components of a gas-turbine power plant was described (no preprint available).

An aircraft gas turbine for propeller drive known as the TG-100 or propjet, designed in 1941 for the Army Air Forces, was described. The full paper was published in the October, 1947, issue of MECHANICAL ENGINEERING, pages 827 to 835 (47—A-19).

A paper discussing problems in high-altitude nutrition and a paper on food in flight were also presented (no preprints available).

APPLIED MECHANICS

The Applied Mechanics Division was prime sponsor of eight technical sessions at which more than 25 papers were read. Many of these papers were available to members through publication in Society publications in advance of the meeting. The others are mentioned briefly in the following paragraphs.

An analytical method developed for determining the natural frequencies of a composite system consisting of a uniform beam with a concentrated mass, spring, and dashpot attached at any point along the length of the beam, was described (47—A-9).[1]

Another paper presented a generalized solution obtained on a mechanical analyzer for the effect of an accelerated sine-wave force on a spring-mass system having linear plus cubic elasticity and linear damping (47—A-53).

A mechanical-analogy-type analyzer of relatively simple construction which gives solutions of vibration problems of systems having a single degree of freedom, was described (47—A-52).

The problem of the symmetrically loaded circular plate with a central hole and with the thickness of the plate at any section varying proportionally to the distance from the center of the plate, was discussed. The results of an investigation of six particular cases were reported and these were compared to corresponding values obtained for plates of constant thickness (47—A-35).

Critical shear stresses of plates above the proportional limit were studied, using the secant-modulus method previously used for determining critical compression stresses above the proportional limit. The results were confirmed experimentally and nondimensional critical-shear stress design curves were presented for use with aluminum alloys (47—A-11).

Calculation of the effect of bending rigidity of stringers upon stress distribution in a reinforced monocoque cylinder under concentrated transverse loads indicated that neglect of stringer bending rigidity results in calculated maximum shear stresses approximately 20 per cent conservative in the field of load application and 50 per cent unsafe in an intermediate field (47—A-12).

In a study of a fixed-edge circular plant subjected to uniform normal pressure, it was shown that the maximum vertical deflection, the maximum radial stress, and the maximum tan-

[1] Numbers in parentheses are preprint numbers. For title and author refer to the list on pages 38 and 40.

Eugene W. O'Brien

Retiring President of
The American Society
of
Mechanical Engineers
for 1947

gential stress can be reduced by reinforcing the plate with a concentric ring (47—A-15).

An analysis of buckling of a simply-supported rectangular plate reinforced by any number of transverse stiffeners and subjected to shearing forces uniformly distributed along the edges, was presented (47—A-17).

The case of the flexible structure in which displacements can be large although the strains are small was discussed. The case was illustrated by the example of flat plate which is generated into an elastic cylinder (47—A-29).

A numerical method for solving directly the problem of the torsion of a bar of constant cross section having one or more internal longitudinal holes was described (47—A-7).

A new method of calibrating electromechanical pickups was presented. The technique described does not depend upon the specific designs of the units (47—A-5).

An investigation of the flutter of a uniform wing with tip weights, in which the flutter system was studied by solving the differential equations for the wing motion, was reported. An extension of a previously published work, "The Flutter of a Uniform Cantilever Wing," the current study presented a refinement of method and reduction of labor required to effect a solution (47—A-36).

A new chemical technique called "mechanical activation," which promises to give many extremely versatile organometallic reactions a commerical significance, was described. The technique was developed from observations which showed that certain organic reagents when used as cutting fluids react vigorously with metal chips produced in a metal-cutting operation even though these same chemicals are relatively inert to uncut metal in bulk. The reaction described is started by the high pressure, high temperature, and highly stressed nascent surface which results from the metal-cutting process (47—A-14).

Data for gas mixtures on a pound-mole basis which greatly reduce the number of gas tables required for calculations of processes in a wide variety of mixtures, were presented. Examples of the use of the data were also given (47—A-1).

E. G. Bailey

President of
The American Society
of
Mechanical Engineers
for 1948

FUELS

Trends unfavorable to the coal-burning locomotive were discussed by coal producers, locomotive manufacturers, and users at a symposium devoted to improvement of the competitive position of coal-burning motive power.

The responsibility of the coal producer was defined as one of giving users coal of better and more uniform quality at lower prices. Mechanization of a mine helps, but producers need assurance of demand created by long-range fuel planning which would specify regional quality and size of fuels which best meet user requirements (47—A-47).

Improvements in boilers and firebox design promise the greatest increases in useful horsepower, while development of a mechanical-draft system for locomotives can add 15 to 20 per cent to drawbar horsepower, manufacturers pointed out. To effect these improvements, a pooling of knowledge and financial support of experimental work must be achieved (47—A-48).

Developments and trends in coal-burning locomotives were outlined from the point of view of manufacturers who must meet first cost, availability, and economy standards of Diesel and future gas-turbine locomotives (47—A-51).

The Norfolk and Western Railway was able to cut costs by increasing productivity of its man power and by increasing availability and utilization of its coal-burning locomotives. This was accomplished by increasing its investment in new and improved service machinery from approximately $13,000 to $26,000 per man during the past 20 years (47—A-49).

Performance data which challenge standards set by Diesel competitors were reported in comparative tests made by the New York Central System in which performance of the "Niagara" type of locomotive was compared to its Diesel counterpart. Under a program of intensive utilization achieved by co-operation between various service forces, the Niagara locomotives achieved a monthly mileage only 16 per cent less than its Diesel competition under similar conditions of service (47—A-50).

Several theoretical studies on the nature of combustion of gases were also contributed. The first described the mechanism

of ignition and flame stabilization of an explosive-gas mixture. Stabilization is achieved when burning velocity in a gas stream equals the velocity of the gases (47—A-33).

The results of tests sponsored by the Bureau of Ordnance and a description of test procedures and thermodynamic characteristics of the combustion of ethyl alcohol and air under high-output conditions were reported. A mixture of 92.5 per cent ethyl alcohol and 7.5 per cent air was burned in a combustor under 475 psia. Exit gas temperatures were varied between 1350 and 2050 F by control of excess fuel (47—A-25).

In another study of the influence of reaction interface extension in the combustion of gaseous fuel constituents, equations were given which permit determination of the magnitude of maximum possible mean energy release rates over any given combustion progress. When natural gas was burned at 1.2 times theoretical air to 99 per cent completion at atmospheric pressure, he average maximum mean energy released over this combustion progress is about 2×10^6 Btu per hr per cu ft of furnace volume (47—A-27).

Economical use of low-cost refuse fuels depends on how they are prepared for burning and on the type of furnace in which they are burned. The characteristics of these fuels was discussed and the design of actual furnaces built to burn them were described (47—A-22).

How pressure affects the rate of combustion of pulverized coal has been under study in connection with work on the coal-burning gas turbine. Results of tests made with four small air-cooled combustors of sheet-metal construction, fired at high heat-release rates in a small gas-turbine setup, were reported (47—A-117).

In another paper the mechanisms of slow oxidation of hydrocarbons were analyzed to show how these can be utilized in oil-burner design improvements (47—A-34).

In a discussion of a synthetic-fuels industry, it was emphasized that such an industry must be preceded by a study to determine areas in which raw materials and water are available in adequate supply. To build up a capacity of 1 to 2 million barrels daily will require several years as well as large amounts of steel and man power. Costs at the plants are anticipated as 3 to 5 cents a gallon higher than present prices of products from petroleum (47—A-40).

GAS-TURBINE POWER

The Gas Turbine Power Division was prime sponsor of three technical sessions during which new methods for solving some of the problems in the field were suggested, gas-turbine combustor efficiencies were discussed, and recent developments in axial-flow compressor design were summarized.

A preliminary design method which reduces tedious calculation required to obtain optimum performance for heat transfer and pressure loss in conventional shell-and-tube heat exchangers was described (47—A-60).

Another heat-transfer study discussed problems involved in design of the plate louvered fin-type of gas-turbine regenerator (47—A-83).

To supplement design methods for circular tube sheets given by the ASME and API-ASME construction codes, a new semi-theoretical method was proposed (47—A-104).

To stimulate discussion on standard expressions for gas-turbine combustor efficiencies, three different expressions were proposed to cover combustion, mechanical, and over-all efficiencies. These efficiences, it was claimed, were meaningful, unambiguous thermodynamically, and should be acceptable for standardization by all groups active in the field (47—A-32).

Combustor-efficiency determinations based on data obtained from thermocouples in the combustor to determine inlet and outlet gas temperatures, accurate enough to study effect of primary variables on combustor efficiency, were reported. The study was made by the National Advisory Committee for Aeronautics (47—A-23).

An accurate chemical method for determining combustor efficiency was discussed. This method overcomes some of the limitations of the heat-balance method and also reveals nature of combustion loss. It was developed by British engineers (47—A-58).

Performance characteristics and design details of various types of axial-flow compressors were discussed in the light of advances made during the last five years (47—A-28).

HEAT TRANSFER

The anti-icing system of the Fairchild C-82 was discussed from the point of view of establishing heat-transfer requirements; and an apparatus to measure in flight the external heat-transfer coefficient was described (47—A-95). The single basic theory, typical systems, and applications of a new method of flash drying materials were outlined (47—A-97). A graph was presented for finding the heat transfer through relatively thick insulation applied to an enclosure having the form of a short cylinder such as a tank. The "relaxation" method of calculation was used (47—A-63).

Experimental studies made by a colloidal suspension of Bentonite in water and powdered aluminum in water to which a wetting agent has been added, using two-dimensional models, were reported (47—A-103). Suitable equipment for rapid and accurate testing of fluid friction and heat transfer in idealized models and in commercial tubular heat exchangers, over a wide range of variables and under standardized conditions of equipment and technique, was described (47—A-102). The heat transfer and pressure drop in shell and tubular heat exchangers with cross flow baffles is affected in a large measure by both the baffle height and the baffle-to-shell clearance. The heat-transfer rate was presented as a function of effective velocity which includes the principal physical variables of the exchanger; and it was also presented as a function of the velocity at the baffle and a turbulence factor. The pressure drop was presented as a function of the velocity at the baffle and a turbulence factor which measures the effect of the contractions "sudden" expansions, and the turning of the fluid stream (47—A-105).

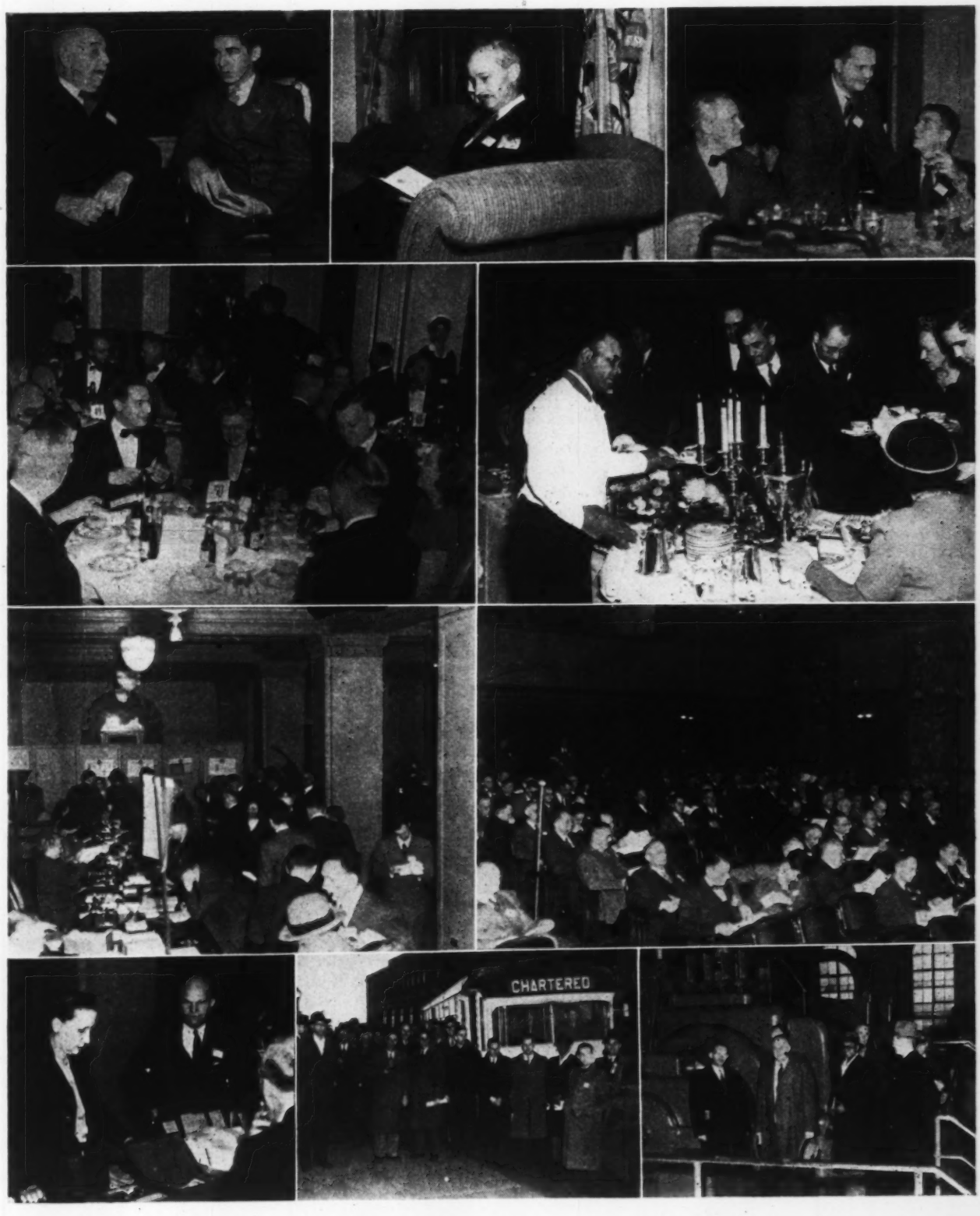
A description was given of an apparatus designed to permit the determination of heat-transfer coefficients of condensing vapor films on the outside of tubes at sub- and superatmospheric pressures and under such ideal conditions as to permit checking the Nusselt equation (47—A-91). Condensing heat-transfer coefficients for Freon-12, N-butane, acetone, and water were obtained for six horizontal finned tubes in a vertical row. The differences between experimental and predicted coefficients for the top tube were less than 14 per cent, and the average condensing coefficient for the six tubes was less than 10 per cent below that for the top tube (47—A-96).

A tentative method for the rapid circulation of the pressure drop during forced-circulation boiling of water was presented. It was shown, by specially developed curves, that the pressure drop during boiling can be estimated quickly once the exit quality, the boiling pressure, and the pressure drop for 100 per cent liquid are known (47—A-113).

HYDRAULIC

Western irrigation projects and the design problems involved the building and testing of the enormous pumps required to lift as much as 4 million acre-feet of water daily more than 200 ft, were featured at the sessions of the Hydraulic Division.

Unusual problems encountered in design of the Granby



Here and There at the 1947 Annual Meeting

Pumping Plant which delivers water across the Continental Divide in Colorado were described. Because of the great variation of suction head the plant is built for underground. Several methods of bringing the units up to synchronous speed were described (47—A-93).

A general account of the requirements for irrigation on the Columbia Basin and Central Valley projects of the Bureau of Reclamation was given (47—A-116).

The Hydrodynamic Laboratory of the California Institute of Technology in which model tests were made and in which intensive research program was carried out in connection with the unprecedented pumping equipment of the Columbia Basin Project, was described (47—A-112).

INDUSTRIAL INSTRUMENTS AND REGULATORS

In connection with the study of residual stresses in welded ships, the University of California conducted tests to determine the effects of time in service, changes in temperature, humidity, and methods of mounting, as well as several waterproofing agents, on the stability of SR-4 electric strain gages. The results demonstrated that these gages, if properly waterproofed and protected from mechanical damage, are reliable for a considerable length of time even under the most severe type of usage (47—A-120).

An air-operated force-measuring system which makes use of a nonmetallic flexible diaphragm as a null-deflection frictionless measuring piston, was described. The system, which gives force readings in a mercury column and is capable of remote transmission, control, and recording of measurements, has found acceptance for test measurements on cradle dynamotors, turbojet engines, and rockets. Other applications were also suggested (47—A-37).

Procedures and results of a typical investigation into the dynamic behavior of hydraulic servomechanism by a-c analysis was described (47—A-70).

A new instrument for continuous analysis of industrial gages for oxygen concentration was described. The magnetic properties of oxygen are used as the basis of response. It was reported that a response of 3 mv per one per cent oxygen can be obtained. Readings are not disturbed by any extraneous gases except some of the oxides of nitrogen (47—A-38).

Another system for indicating rate of flow and totalized quantity of a liquid was also described. The system, consisting of a transmitter mounted on the metering device and a synchronous-motor-actuated indicator, provides pointer indication of rate of flow and cyclometer indication of total flow (47—A-67).

MATERIALS HANDLING

Special handling equipment used at railroad shops and terminals, such as hoists and jacks for steam and Diesel locomotives, passenger and freight cars, drop tables for removing wheels from all power and rolling stock, and locomotive spotters for accurately spotting locomotives for valve settings, were discussed (no preprint available).

The program of rehabilitating the distributing warehouses of the Bell System, which had become outmoded during the war years and which were inadequate to handle the tremendous volume of new business, was described. New materials-handling methods and equipment were discussed (47—A-94).

How several concerns have successfully solved the problems of rising costs and lower worker productivity and attained the benefits of including material handlers in their incentive programs, was reviewed (no preprint available).

The moving of material during actual processing has been, to a large extent, overlooked. It was pointed out that through careful analysis of this part of the processing cycle, it can be made to yield rich dividends if handling is reduced to a minimum. Items to be considered which have a direct relation to materials handling and cost of a product were discussed (47—A-24).

OIL AND GAS POWER

Results of tests show that 0.2 to 0.3 ppm of aldehydes in Diesel-engine exhaust gas is the threshold concentration for perception of objectional odor and that concentrations above one ppm will cause nasal and eye irritation. Full-scale tests in the removal of aldehydes by scrubbing were made using water and using a solution containing 10 per cent sodium sulphite by weight and 0.5 per cent hydroquinone. The latter showed substantial removal of all aldehydes for a period of 7 hours and 90 per cent or more for a 15-hour period (47—A-108).

Because characteristics of liquid fuels used in Diesel operation affect over-all performance, and because of the changing make-up of available Diesel fuels, it was suggested that new standardization tests be developed to establish relative stability and combustibility of these fuels. Results of recent investigations dealing with the nature of exhaust products resulting from combustion of Diesel fuels were presented (47—A-124).

Engineering and economic problems involved in transmitting power of a marine gas-turbine power plant with its high rotative speeds to the propeller which requires low rotative speeds for maximum efficiency, were discussed. Various transmission systems available today were studied to determine which offers the most attractive prospects (47—A-69).

A new theoretical heat cycle called by the authors the "hexagon cycle" was reported. It is the result of eight years of work and only recently has been declassified. Principal known heat cycles were shown to be special cases of the new cycle, which, it was claimed, forms a basis of a general theory of heat cycles (47—A-43).

PETROLEUM

Numerous discussions between the representatives of turbine builders, operators, oil suppliers, turbine-equipment suppliers, and consulting turbine engineers in attendance at meetings of Technical Committee C, Section I, of the American Society for Testing Materials, have indicated the desirability of pooling the available experience with respect to the preparation of new turbine lubricating systems in order that the most desirable practices might be standardized. This pooled information was presented in a special report and should be considered a "guide to desirable practices" (47—A-39).

POWER

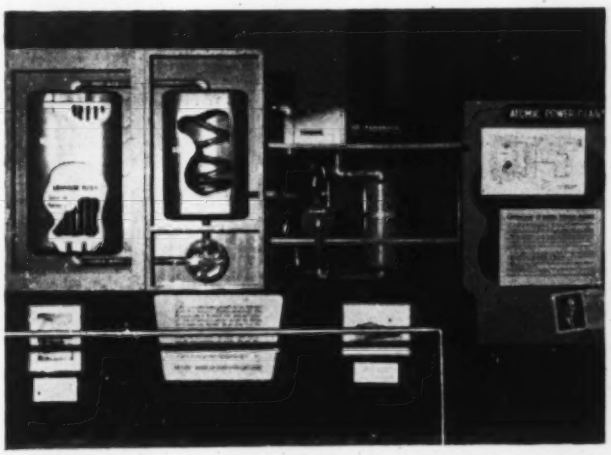
The latest step forward in economical steam-electric power generation was described in a detailed report of considerations involved in the design of the 2000-psi, 1050 F, and 1000 F reheat cycle chosen for the Philip Sporn and Twin Branch power stations of The American Gas and Electric Company system. A heat rate of 9270 Btu per net kwhr output, the highest heat rate designed into any steam-electric power station, was made possible by use of the regenerative reheat cycle (47—A-87).

A method of increasing steam-turbine efficiency and decreasing blade deterioration in the exhaust stages was reported. Low-pressure heating steam is introduced into the hollow spaces designed into stationary blades and diaphragm of the exhaust stages to reduce condensation of exhaust steam (47—A-110).

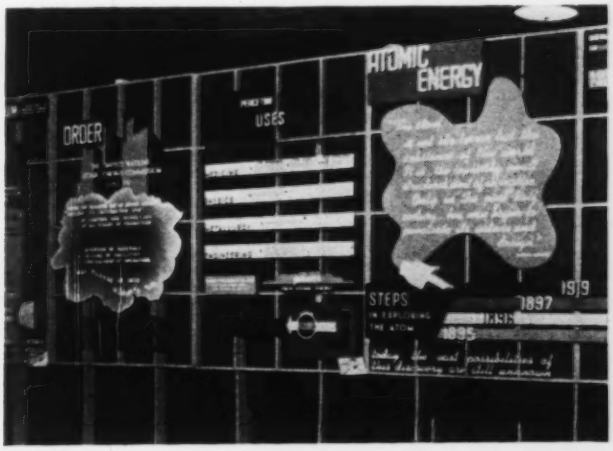
The first actual measurement of the velocity of sound in superheater steam, accomplished by use of a simple acoustic interferometer, was described (47—A-119).

Since nuclear power at its present stage of development de-

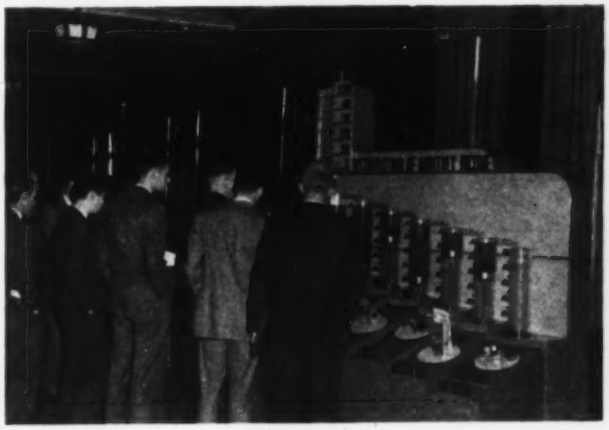
ASME Educational Exhibits at the Annual Meeting



(1)

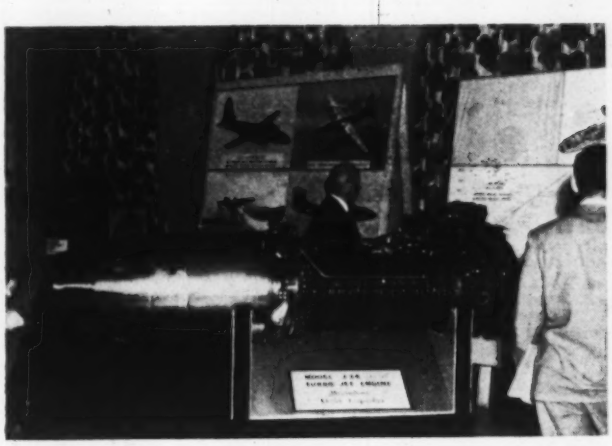


(2)



(3)

(4)

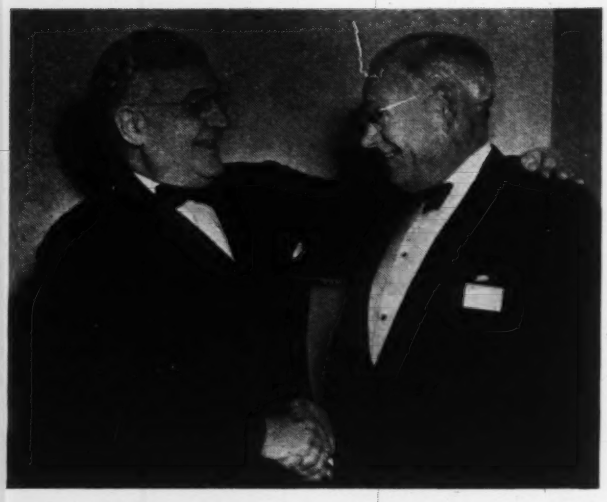


(5)

(6)

INTERESTING EXHIBITS CONVENIENTLY SET UP ON THE LOUNGE FLOOR OF THE HEADQUARTERS HOTEL WHERE THEY COULD BE STUDIED AT LEISURE WAS A NEW FEATURE OF THE 1947 ANNUAL MEETING.

(Exhibits (1) and (2) are part of the extensive educational material on nuclear energy contributed by the Brookhaven National Laboratory of Camp Upton, Brookhaven, Long Island, N. Y.; (3) and (4) show members watching a demonstration of the James D. Mooney "dynamic graphics," which shows by means of mechanical principles how the laws of economics operate; (5) and (6) are two of the many exhibits of turbojet engines, rocket engines, and gas turbines contributed by American manufacturers and the Armed Forces. Captured German equipment was also on exhibit.)



ALVIN E. DODD, RECIPIENT OF THE 1947 GANTT MEDAL, IS CONGRATULATED BY C. E. DAVIES, SECRETARY ASME

pends on heat technology, the new field adds little that is new for the power engineer. It does introduce three new operations, those of shielding, remote control, and health safety. The prime responsibility of the nuclear engineer ends when he produces the desired temperature level. Here the power engineer takes over, but both are concerned with the hazards of radioactivity (47—A-109).

Marine Night of the Power Division was devoted to discussion of the need aboard ship for pure feedwater as steam pressures of marine steam power plants continue to rise. The discussions were begun with a report on vapor-compression distilling units capable of producing water suitable for storage batteries directly from sea water (no preprints available).

This was followed by a review of the economic and engineering advantages of modern low-pressure steam-heated distilling plants for this service (47—A-86).

Three general types of filtration equipment designed for removal of oil from feedwater and capable of producing a filtrate far below the specification set by the U. S. Navy and U. S. Maritime Commission were discussed. Irrespective of the type of prime mover used, installation of filtration equipment aboard ship was advocated (47—A-90).

PROCESS INDUSTRIES

A general picture was given of the present state of stream pollution and the prospects for its abatement, the contrast between the past and present attitudes of the public as shown by its interest, and the more stringent antipollution laws. How one state is attacking the problem of stream pollution was cited, and reference was made to interstate and federal legislation. Contrasts between sewage and industrial wastes treatment were made. Industry's responsibility for proper waste disposal were discussed, and reasons for the mechanical engineer's interest in and responsibility for stream-pollution abatement were given. It was pointed out that waste treatment sometimes yields handsome profits but often is a direct additional cost of production. The mechanical engineer's approach to waste-treatment problems; the need for representative and accurate data; and the need for the advice of an engineer skilled in waste treatment, were stressed (47—A-66).

RAILROADS

The annual progress report on railway mechanical engineering was presented revealing many new developments and describing briefly numerous steam, Diesel, and electric locomotives built during the year. Progress continued in the development of coal-burning gas-turbine locomotives (no preprint available).

A forum on locomotive developments included a paper which presented data obtained on a series of tests conducted in a wind tunnel, using a 1/12 scale model of a modern passenger steam locomotive (47—A-82). The status and data on coal-burning gas-turbine locomotives (47—A-118) and a description of the Pennsylvania Railroad's new 2000-hp Diesel-electric locomotive unit designed for freight and passenger service were also presented (47—A-73).

A symposium on freight-car construction covered such items as the application of low-alloy high-strength steel in freight cars (47—A-107); the use of aluminum alloys best-suited for a particular type of freight car (47—A-79 and 47—A-89); the possible weight reduction of air-brake apparatus (47—A-106); freight-car-truck progress since 1914 (47—A-71); and the development and trend in the design of hopper-discharge types of railway cars (47—A-78).

RUBBER AND PLASTICS

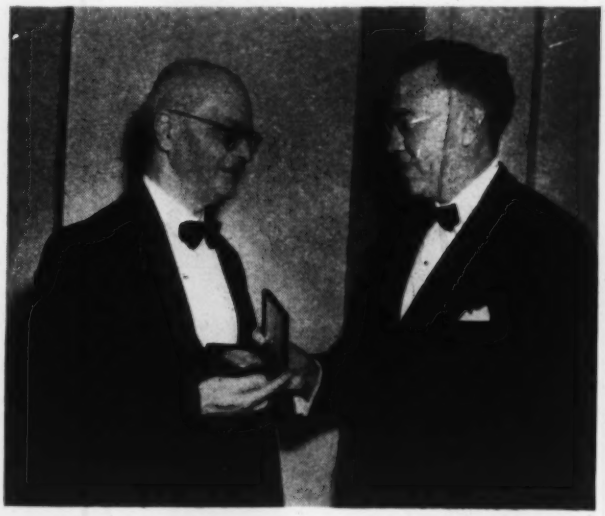
High-strength low-pressure-molded reinforced plastic laminates have been adopted as standard, in place of steel, in many types of aircraft fabricating tools. The material characteristics, design considerations, and adaptability of plastic to tooling in other industries were discussed. Additional possible applications based on present techniques and future developments were also outlined (47—A-101).

The physical, chemical, and electrical properties of silicone rubber as affected by high and low temperatures have been studied and compared with those of other elastomers. These properties were discussed in an effort to show where silicone rubber could or could not be used. Compounding and fabrication techniques were also presented and it was shown how these techniques, together with the properties of the rubber, affect the design of silicone molded and extruded parts (47—A-126). The various uses of rubber in the automotive industry were also discussed (47—A-125).

The significant developments and advances in rubber and in plastics during 1947 were presented (no preprint available).

WOOD INDUSTRIES

The co-ordinated operation of three sawmills, two pulpmills,



PRESIDENT O'BRIEN PRESENTS THE 1947 WORCESTER REED WARNER MEDAL TO ARPAD L. NADAI

a plywood mill, and several by-product factories as a single unit, was presented as an illustration of integrating the utilization of the variety of raw material that enters the modern wood-conversion plant (47—A-45). The various types of jigs and the important role they play in laminating first-class boat parts were described. The method of curing and types of recorders and curing chambers used were discussed (47—A-68).

It was shown that by adding small concentrations of organic chemicals, known as surface or wetting agents, the penetrating and wetting action of water is increased several hundred per cent. Water so treated was said to offer great possibilities in fire fighting (47—A-92). A paper describing how to design a plant layout and select or develop equipment for the mass-production of molded-plywood furniture was presented (47—A-44).

The theory of radio-frequency heating of "nonconducting" materials such as wood, and the design and operation of radio-frequency generators used for industrial heating, were discussed. The theory and practice of applying RF heating for making plywood, laminated timbers, edge-glued panels, tennis rackets, and glued-wood cabinets were presented (47—A-115). A rapid method developed at the U. S. Forest Products Laboratory for determining the durability of glue joints in laminated beams intended for exterior service was described. Results of the test were correlated with more extended laboratory exposures and with long-term soaking and weathering (47—A-85). A new process called Raytronic, a method of bonding of resin-glued woodwork, as distinct from the bag-molding and "cooking" method employing an autoclave with steam heat and pressure, was described (47—A-26).

MACHINE DESIGN

An author pointed out the difficulties of maintaining exact alignment with plain slide bearings and emphasizes the advantages of preloaded bearings especially for precision work. A number of examples of the application of preloaded ball bearings to both light and heavy machines were given (47-A-42).

The importance of the cam as a machine element prompted another author to make a careful study covering the influence of the mass, elasticity, and damping of a cam-driven system upon the magnitude and character of the forces upon a cam. Starting with the basic geometry of the cam, a careful mathematical analysis of the factors involved is presented (47-A-46).

High-speed machining of aluminum is at present limited by the speeds of available machine tools. Sintered-carbide cutting

PAUL W. KIEFER RECEIVES ASME MEDAL FROM PRESIDENT O'BRIEN

RAYMOND C. MARTINELLI (RIGHT), RECEIVES THE 1947 MELVILLE PRIZE MEDAL FROM PRESIDENT O'BRIEN

tools are adequate for present speeds but as machine-tool speeds are increased new materials may be required. The excellent machining qualities of aluminum indicate that present speeds can be increased materially. In 1944 the Aluminum Company of America, with the co-operation of a number of leading manufacturers of machine tools and equipment, initiated the development of a lathe to operate at a maximum speed of between 7500 and 10,000 rpm for the purpose of investigating high-speed machining of aluminum. The lathe and its controls are described (47-A-41).

When designing cams the designer must determine the smallest cam capable of producing the prescribed motion and the extremes of motion that can be obtained from a cam of limited size. The solution of the problem depends upon the selection of the correct pressure angle, a factor generally understood, and the cam curvature, a factor not so generally understood but of great importance. This paper considers cam curvature from an analytical approach (47-A-77).

A discussion of the need for close co-operation between the engineering and production departments was presented. In spite of the sense of finality of the blueprint, design is never complete and development continues for the life of a design. Consultation between the design engineer and the production department during development assures proper tooling and methods, and a design that can be produced efficiently (47-A-98).

An analysis of organization on a divisional basis and the responsibilities of the divisional manager was reported. Production planning requires the co-ordinated activities of all of the various supervisors involved (47-A-99).

A discussion of the various aspects of engineering leading to economical design for mass production was presented. This included an analysis of organization and objectives, the research groups, and product engineering (47-A-100).

The importance of reducing handling time in its relationship to floor-to-floor time was studied with a view to transferring as many of the operator's functions as possible to automatic control. Brass turning on a small turret lathe is used as the basis of the investigation. With only 20 per cent of the total time devoted to machining, electrification of the machine and automatic controls seem to offer higher production and lower costs (47-A-76).

PRODUCTION ENGINEERING

Quality control by statistical methods, more generally known

as "quality control" must not be confused with "control of quality." Quality control is used to describe the control of quality by the use of mathematics and statistical methods as scientific aids toward the determination of quality conditions. Control of quality is obtained through such means as better tools. As the outgrowth of the "efficiency expert" period, quality control has a wide field of study ahead of it. A careful study of quality control and its possibilities is presented (47-A-65).

METALS ENGINEERING

Results obtained from experimental investigation of the process of cartridge-case drawing carried out over a period of several years in order to determine the effect of a number of variables upon the draw forces and stresses was reported. A study covered of both die and punch surface conditions and lubrication (47-A-10).

An investigation carried out to analyze experimentally and theoretically the hydraulic bulging of a thin circular membrane was presented. The commercial application of this project lies in its relation to the design of safety diaphragms used for the protection of pressure vessels. Three different conditions of metal were used. Copper disks clamped around their periphery were bulged by hydraulic pressure through a 6-in. diam bulge disk.

The die was radiused to $1/2$ in. to prevent fracture at the periphery and a special study was made of the stress at the pole at which point rupture usually occurred (47-A-20).

The locomotive firebox seems to provide the best integration of desirable features required to produce high rates of evaporation. The restricted space available on the locomotive combined with the movement to which the firebox is subjected present highly specialized problems in design.

Improvements in design, material, and construction have not given the results that might be expected because of a lack of the true importance of stay-bolt leakage. This paper is devoted to a discussion of design, choice of materials, and methods of stay-bolt application. A thorough study of the advantages made possible by the improved stay-bolted firebox has been made difficult by premature failure resulting from stay-bolt leakage. This paper covered an analysis of the factors that influence the importance of the staybolt in the life of the firebox (47-A-59).

Cleavage fractures develop in steel plates and structural members of rectangular or complicated cross section by multiaxial and unsymmetrical systems imposed by various service conditions. Conventional tensile and bend tests were found to be unsatisfactory for determining resistance to cleavage fracture. A new type of test coupon a "cleavage-tear" test was described. This test combines axial tensile and transverse bending stresses, induced by eccentric loading (47-A-75).

AMERICAN ROCKET SOCIETY

The American Rocket Society this year was the prime sponsor of two technical sessions and participated jointly in two other sessions with the Gas Turbine Power and Oil and Gas Power Divisions of ASME.

The story of Project 3401—the pioneer rocket project of the U. S. Navy—was presented. The purpose of this project was to develop a liquid-propellant rocket for use in assisting the take-off of large flying boats. The creation of this project marked the first official interest of the U. S. Navy in liquid-propellant rockets (no preprint available).

Liquid rocket-motor testing in three phases—research, development, and production—was outlined. Test-stand-structure design regarding essential components; and the factors such as locations, scale, and type of operations, safety, protection from weather and the like were discussed. Test-stand apparatus, instrumentation, and test methods were also reviewed (no preprint available).

A thermochemical method for calculating the performance of any rocket-propellant combination was described. Assumptions are similar to those used in combustion of conventional fuels with air and the computed results are usually within 10 per cent of the experimental values. Calculated data for 13 liquid-propellant combinations were given (47—A-80).

TECHNICAL COMMITTEES

The ASME groups of technical committees, following their usual custom, co-operated with the professional divisions in the planning for and carrying through of the technical sessions. In addition, these five technical committee groups held forty-four technical committee meetings and conferences.

Three of the five committees which determine the policies of these groups of technical committees held their annual meetings during the week. The ASME Standardization Committee, Elmer J. Bryant, chairman, led with its meeting on Monday afternoon. The ASME Power Test Codes Committee, A. G. Christie, chairman, came next with its meeting on Monday evening. The ASME Research Committee, Herman Weisberg, chairman, held its meeting on Tuesday afternoon. All three of these meetings were well attended. The total attendance was 540.

RESEARCH

The Standing Committee on Research met to discuss progress in the past year and to consider further means which may be employed in strengthening the Society's research activities.

Seventeen special and joint research committees met, with a combined attendance of approximately two hundred. Although not holding a meeting, the Research Committee on Properties of Gases and Gas Mixtures sponsored two technical sessions on gas properties, co-sponsored by the Applied Mechanics and Heat Transfer Divisions. A third session was under the auspices of the Applied Mechanics, with the special research committee and Heat Transfer Division co-sponsoring. The first session was devoted to seven contributions on the present state of our knowledge of gas properties. The second brought out industry's requirements in gas-properties research and facilities for and work under way in this field. The third pertained primarily to tabular and graphical methods of presenting the various properties. These sessions showing what is now known and what industry needs to know were designed to spark-plug an extensive and long-term research program under the sponsorship of the special research committee.

The Research Committee on Lubrication met to finalize plans on its coming research program on high-pressure viscosity of lubricants. This committee also sponsored two sessions, the first of which was devoted (1) to an analysis of the operating characteristics of a full floating journal bearing, (2) to oil flow and temperature relations in a lightly loaded journal bearing, and (3) to measurements of the combined frictional and thermal behavior in journal-bearing lubrication (47-A-61). The second session presented (1) studies in boundary lubrication (47-A-18), (2) high-temperature performance of silicone fluids in journal bearings (47-A-114), and (3) a paper on the hydrosphere, a new hydrodynamic bearing (47-A-122).

The Joint Committee on Effect of Temperature on Properties of Metals met to discuss further its reorganization plan aimed at providing concerted action in attacking problems involving high-temperature characteristics of materials in varying applications. The joint committee also sponsored a session at which a report was presented on further investigations of the

EEI–AEIC study of graphitization in piping. Papers were also given on (1) long-time creep and rupture tests on moly-vanadium pipe material in comparison with low chrome-vanadium compositions, (2) a study of the mechanical properties including creep and of the welding and fabrication characteristics of one-half per cent chrome-moly steel for high-temperature service, and (3) the structural stability of several cast low-alloy steels at elevated temperatures.

The Executive Committee of the Joint Research Committee on Boiler Feedwater Studies elected new officers, and ways and means to effect an aggressive research future received serious discussion. Technical programs were projected for meetings of several of the sponsor bodies in 1948.

Problems to be met in raising superheat temperatures to 1400 F, for example, were discussed by the Research Committee on Critical Pressure Steam Boilers. Such an increase would involve design, material, and economic considerations. Studies will be made during 1948, and it is expected that papers will be presented during the 1948 Annual Meeting on material problems and the economics surrounding such a change.

Further development of a research program on measurement and control of small rates of flow was the topic when the Research Committee on Fluid Meters convened. Present and former members of this committee honored R. J. S. Pigott and J. R. Carlton at a dinner at which tribute was paid to these men for their service as chairman and secretary, respectively, over a long number of years.

The Research Committee on Plastic Flow of Metals paid tribute in its meeting to the memory of its late member, Dwight F. Windenberg. Plans were further formulated for the presentation of a symposium with the Applied Mechanics Division on Plastic Flow of Metals Under Biaxial Stress, to be presented in 1948.

Results of past large-scale tests were discussed by the Research Committee on Furnace Performance Factors, whose aim is to collect, develop, and rationalize data on the performance of commercially important furnaces as an aid to design and operation. Groundwork was laid for tests involving a type of boiler furnace not heretofore tested.

In addition to the foregoing, the following research committees also met: cutting fluids, internal-combustion engines, metal-cutting data and bibliography, strength of vessels under external pressure, automatic regulation theory, condenser tubes, bolting materials for high temperature, and fluid meters subcommittees.

To keep the Society better informed, more detailed reports on ASME research are planned for subsequent issues throughout the coming year.

STANDARDS

The standards group of technical committees held a total of eighteen meetings within the week with a total attendance of two hundred and fifty. The business transacted at these 18 meetings was largely of a routine nature. It had to do with the revision of present American Standards developed under the procedure of the American Standards Association with one exception, and the initiation of work on new American Standards. It is worthy of note, however, that the material discussed at the five meetings on screw threads of various kinds is to serve as a basis for further discussions with the British and Canadian Committees in an effort to bring about the unification of this product in the three countries.

The meetings of the Sectional Committee on the Standardization of Pipe Flanges and Fittings, B16, and its Subcommittee No. 3 on Steel Flanges are significant since at these meetings the war ratings of the steel flanges were accepted and ordered to letter-ballot vote of the members of the sectional committee.

The Sectional Committee on the Standardization of Pipe Flanges and Flanged Fittings, B16, welcomed at this meeting its new chairman, Mr. Emmart LaCrosse, vice-president and director of engineering, Stone and Webster Engineering Corp., Boston, Mass.

Very good progress was made at the first meeting of the new Committee on the Standardization of Letter Symbols for Aeronautics and Aerodynamics, Z10. Eight members of the committee were present including Dr. T. F. Ball, chairman, and Mr. R. C. Hopgood, secretary. The membership includes representatives of all of the principal groups interested in this project.

With the meeting of Sectional Committee B5 on the Standardization of Small Tools and Machine-Tool Elements on Wednesday afternoon Mr. William C. Mueller completed sixteen years of exceptionally effective service on this committee, ten years of which he served as chairman. Since, however, he is slated for retirement from the Western Electric Co., at Hawthorne, Ill., next spring he presented his resignation as chairman and as a member of the committee. This was accepted with many expressions of sincere regret by the members of the committee. Mr. Perry L. Houser, the secretary of the committee was unanimously elected chairman to succeed Mr. Mueller. Mr. A. F. Murray was elected vice-chairman.

POWER TEST CODES

Meetings of eight of the committees of the power test codes group were scheduled and held during the Annual Meeting week. A list of these eight committees with the names of their chairmen follows. The total attendance at this group of meetings was seventy-three (73).

At the meeting of the ASME Power Test Codes Committee Monday evening Mr. Lee Schneitter, chairman of PTC Committee No. 17 on Internal-Combustion Engines, reported that his committee had completed the revision of the ASME Test Code on Internal-Combustion Engines, a task on which it has been at work for a number of years. The revised draft is now before the members of the ASME Power Test Codes Committee for approval by letter ballot.

At the same meeting chairman W. E. Caldwell reported that PTC Committee No. 6 on Steam Turbines had completed the revision of the Test Code for Steam Turbines (1941 edition) and the revision to the Appendix to this Code.

A similar report was made by R. B. Smith, chairman of PTC Committee No. 10 on Centrifugal and Turbo-Compressors and Blowers. This new test code entitled "Test Code for Centrifugal, Mixed-Flow, and Axial-Flow Compressors and Exhausters" will soon be mailed to the members of the standing committee for vote on approval by letter ballot.

On Thursday afternoon the Power Test Code Committee functioning through a special subcommittee, of which R. V. Kleinschmidt is chairman, conducted a symposium on the heating values of fuels. More than one hundred persons were present and many took part in the discussion which followed the presentation of three papers (47-A-123).

BOILER CODE

This year the activities of the Boiler Code group of committees was confined to a meeting of its Committee on Feedwater of the Subcommittee on Care of Power Boilers in Service, C. W. Rice, chairman, and to participation in the meeting of the Special Research Committee on Strength of Vessels Under External Pressure. The attendance at the first-named meeting was sixteen.

SAFETY GROUP

The participation of the safety group in the 1947 Annual

Meeting was limited to the sponsoring of a technical session Thursday morning. This session was well attended. E. R. Granniss, a member of the ASME Safety Committee, presided at the session and J. J. Zeitner, the new chairman of the ASME Safety Committee, acted as recorder. Three papers were read and discussed (47-A-30), (47-A-55), and (47-A-31).

ASME URGED TO SUPPORT EJC

On Sunday evening the Council met with representatives of the professional divisions, committeemen, and other members who had arrived early for the usual discussion of Society affairs. President O'Brien presided and the subjects for discussion related to the Engineers Joint Council (EJC), and its accomplishments during the past year.

Mr. O'Brien reviewed briefly the history of EJC which came into being following the dissolution of the American Engineering Council for the purpose of providing an organization through which the Founder Societies could take joint action on matters of common interest. As presently constituted EJC is made up of the presidents in office, the junior past-presidents, and the secretaries of the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Institute of Chemical Engineers. In certain cases the National Society of Professional Engineers has also been represented on EJC.

A notable achievement of EJC during the war was the organization of War Production Clinics throughout the nation, Mr. O'Brien said. EJC had also been represented at several Congressional committee hearings; it had been successful in urging the appointment of an engineering committee on the Atomic Energy Commission; it had been invited to appoint a representative on the United States National Commission for UNESCO; and it had set up the Engineers National Committee, which, at the invitation of the State and War Departments, had made reports on the industrial disarmament of Germany and Japan.

Within the last twelve months, Mr. O'Brien announced, EJC had brought out a Manual on Collective Bargaining for Engineers and through a panel of engineers there had been introduced into the Taft-Hartley bill certain safeguards for engineering employees which did not exist under the Wagner Act. During the past year also the report of the EJC Committee on Employer Practice Regarding Engineering Graduates had been published (MECHANICAL ENGINEERING, April, 1947) and the Committee on Economic Status had issued its report, "The Engineering Profession in Transition" (MECHANICAL ENGINEERING, September, 1947). Mr. O'Brien referred briefly to some of the significant results of both reports.

Mr. O'Brien announced that the report of the EJC Committee on the Organization of the Engineering Profession had recently been received, but he gave no details concerning it. In closing his introductory remarks, he pointed out that EJC represented only five national engineering societies comprising approximately 60,000 engineers, that its function was advisory, and that action on its recommendation had to be referred to the constituent societies, a process which took time and patience. ASME should, he declared, support EJC to the limit.

EMPLOYER PRACTICE AND ECONOMIC STATUS

To report on the findings of the EJC Committee on Employer Practice, Mr. O'Brien called on E. G. Bailey, president-elect, who had served as chairman of that committee. Mr. Bailey said that he had long been concerned that employers did not fully appreciate the value of the young engineers on their staffs and that employer practices regarding engineering graduates were not uniform. He had called this to the attention of EJC which had then organized the committee and named him to be its chairman. The committee, he said, had procured its data by means of a questionnaire addressed to 174 employers in various industries. This report was published in April, 1947, and a supplemental report (see this issue, pp. 13 to 16) was presented to EJC in November in which comparisons were made with the findings of the report of the Committee on Economic Status, "The Engineering Profession in Transition."

Mr. Bailey called attention to the fact that the data in the two reports of his committee had been obtained from employers, while those in the report of the Committee on Economic Status had come from questionnaires addressed to individual engineers. He pointed out some of the differences in the findings of the two reports. He also referred to discrepancies in the various estimates of demand for engineers over the next four years presented in the EJC report and in other reports by the American Society for Engineering Education. His purpose in calling attention to these comparisons was to remind readers of the reports that care should be taken in drawing conclusions from the data presented.

R. M. GATES REPORTS ON UNESCO

R. M. Gates, past-president ASME and representative of EJC on the United States National Commission for UNESCO, said that W. E. Wickenden, who died early in September, had been the original EJC appointee to that post. As alternate, Mr. Gates had succeeded Mr. Wickenden. Mr. Gates reported on meetings of the U. S. National Commission and on the recent meeting of UNESCO in Mexico City he had attended. To the natural-sciences section of UNESCO, Mr. Gates reported what EJC had been doing in the collection of books for war-devastated libraries and in main aining international scholarships. He astonished the group by the statistics he gave it of the extent of the engineering organizations represented by EJC and the committees, committeemen, local sections, and student branches, and promised the group that EJC was ready to serve UNESCO whenever asked to do so.

RECENT ACTIVITIES IN INTERNATIONAL RELATIONS

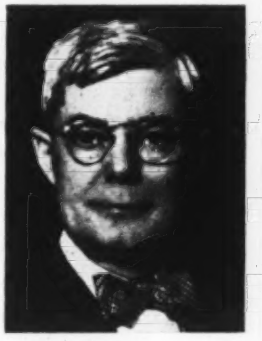
The activities of the EJC Committee on International Relations were reported by its secretary, Gen. S. E. Reimel, of the ASME staff. He spoke first of the work of the EJC Commission on Latin America which, during the year, had issued a quarterly *Adelantos de Ingenieria* to engineers and engineering schools in Latin America. This quarterly consists of articles reproduced from the publications of the societies represented on EJC. Funds for this project, which had been made available to provide an interchange of engineering literature between the nations in North and Latin America, were now exhausted, he said, and the Committee was looking for ways to continue the publication, which had been favorably received.

General Reimel also told of the desire of engineering societies in South America to hold a Pan-American Engineering Congress. In preliminary discussions on the proposed Congress, EJC had been represented by James S. Thompson, chairman, McGraw-Hill Book Company. The Commission on Latin America had gone on record, he announced, as favoring such a Congress in 1949.

The EJC project of collecting books for war-devastated libraries had resulted, to date, in sending about 60,000 volumes abroad, General Reimel reported. Each book contained an appropriate bookplate bearing the name of its donor and a postal card with which the library could acknowledge receipt of the book. These cards are now coming to ASME headquarters and will be forwarded to the donors. Distribution of these books had been carried on by the American Book Center.

New Members of the 1948 ASME Council

Regional Vice-Presidents



FRANK M. GUNBY

P. B. EATON

T. E. PURCELL

J. CALVIN BROWN

Library of Congress, General Reimel said. He also reported that the American Library in Paris had been made an ASME depository.

General Reimel said that it had long been the opinion of EJC that there should be an engineer in the Department of State and that the suggestion had been made to the Secretary of State who had promised to consider it. EJC had nominated an engineer for the mission to Greece and for the Scientific Mission to London, at the request of the State Department. Engineering needs in connection with the Marshall plan, such as standardization and industrial know-how, were mentioned by General Reimel.

A report on the status of the World Engineering Conference was also presented by General Reimel who had visited Europe in the fall of 1947 and had attended a meeting of the Council and Executive Board of the World Engineering Conference in Zurich, Switzerland. A more complete report on this new organization was published in MECHANICAL ENGINEERING, December, 1947, page 1069.

In concluding his report, General Reimel said that the policy of EJC Committee on International Relations of "accrediting" engineering societies in other countries through which EJC could carry on its work was being extended. He explained that his function with ASME had included giving aid and advice to foreign visitors who average about one every day.

DISCUSSION OF THE MARSHALL PLAN

Following the presentation of the work of EJC, opportunity for general discussion was afforded and several questions from the floor were answered. Attention was then focused on the Marshall plan and a number of members, including Jerome B. McMahon, of Chicago, Past-President D. Robert Yarnall, Frederick S. Blackall, Jr., member of the Council, and L. W. Wallace, of Cleveland, presented their views on the plan.

THE ASME COUNCIL

The ASME Council and its Executive Committee and vice-presidents had a busy time at the Atlantic City meeting. The Executive Committee met on Sunday morning, and the Council on Sunday afternoon and on Monday morning and afternoon. Council members were also present at the joint conference with professional divisions and committees on Sunday night, at the Business Meeting on Monday afternoon, and at a private dinner on Monday evening. The vice-presidents met on Tuesday afternoon for a discussion of their special problems, and on Thursday afternoon, with the Meetings and Professional Divisions Committees.

REPORTS APPROVED

The Annual Report of the Council (see pages 41 to 48 of this issue), the reports of Committees to the Council, the Treasurer's report, and the report of the Woman's Auxiliary were presented by the Secretary and were approved.

STUDENT BRANCHES

It was announced that by an agreement arrived at between the vice-presidents of Regions IV and VI, the University of Louisville and the University of Kentucky were transferred from Region IV to Region VI.

FELLOW GRADE

The Secretary announced the result of the letter ballot on Constitutional amendments sent out on September 25 and counted on November 12. Amendments affecting the Fellow grade of membership were approved. (See also report on Business Meeting, page 61.)

NEW PUBLICATION PROCEDURE

Member letter ballots on a proposal to make certain changes in the publication procedure were also counted on November 12, the Secretary announced, and the plan proposed was approved. The important features of this plan are to place Transactions and the *Journal of Applied Mechanics* on a subscription basis to members and to add a section "ASME Technical Digest" to MECHANICAL ENGINEERING. The first of these digests will be found in this issue, pages 35 to 37. It is planned to present a digest of every paper presented at a Society meeting for which a manuscript is available and to offer for sale copies of all papers digested. Some of these papers will appear in Transactions and the *Journal of Applied Mechanics*, and the individual copies offered for sale will be in type. Other papers will be in mimeographed form, these papers being those, approximately 50 per cent of the total, that heretofore the Society has not published except for use at meetings. Papers used in

New Members of the 1948 ASME Council

Directors at Large

J. B. ARMITAGE

A. L. PENNIMAN, JR.

W. M. SHEEHAN

MECHANICAL ENGINEERING quite naturally will not appear in the new digest section.

As a result of balloting on the new plan, several letters of comment and criticism were received at headquarters. The Secretary explained that these letters had been acknowledged and had been studied by the Publications Committee. L. N. Rowley, chairman of the Publications Committee, announced to the Council certain recommended modifications of the plan. One of these was to offer the eight issues of the Transactions to members on a subscription basis, as well as the *Journal of Applied Mechanics*, and another was a coupon scheme by means of which individual copies of Society papers can be purchased, thus making the ordering of and payment for these papers more convenient. Mr. Rowley said that other modifications of the plan, to reduce cost and to increase convenience in ordering, were being considered but decision would have to be taken after experience with the new plan had demonstrated their value and practicability. The Council declared the new publication plan to be effective Jan. 1, 1948, and ordered that every means be taken to publicize it and its services to the members.

Several recommendations of the Publications Committee approved by letter ballot of the Board on Technology were also presented by Mr. Rowley at the request of R. F. Gagg, chairman of the Board. One of these recommendations, that the question of charging members a registration fee to cover partially the cost of national meetings, was fully debated by the Council with the result that the Council voted *not* to charge registration fees to members for the present.

AMENDMENTS TO CONSTITUTION AND BY-LAWS

Several changes in the By-Laws were submitted for first reading. Amendments to the Constitution and By-Laws by means of which the Canons of Ethics, approved by the Engineers' Council for Professional Development, would be substituted for the present Code of Ethics, were presented for first reading. A suggested change of wording in one of the Canons was referred to W. F. Ryan, the Society's representative on the ECPD committee that drafted the Canons.

POLICY ON MEETINGS

After considerable discussion the Council adopted a policy, the effect of which is not to hold meetings at hotels where charges are made for meeting rooms.

CERTIFICATES OF AWARD

Certificates of Award were presented to S. Timoshenko, Lillian M. Gilbreth, W. Trinks, and Lionel S. Marks in appreciation of their services as ASME Lecturers.

Members of the former Committee on Sections, whose functions and duties were taken over by the regional vice-presidents, were also honored with certificates of award. This committee, which was continued until December, 1947, to assist the regional vice-presidents, consisted of the following: L. E. Jermy, J. A. Keeth, O. B. Lyman, S. D. Moxley, and A. R. Mumford. All were present except Mr. Lyman, and Past-President Warren H. McBryde was requested to present the certificate to Mr. Lyman.

A certificate of award was presented to C. E. Lucke, and is noted on page 63 of this issue.

1947 ANNUAL BUSINESS MEETING

The 1947 Annual Business Meeting of the Society took place on Monday afternoon. President O'Brien presided.

The Annual Report of the Council (see pages 41 to 48 of this issue) and the reports of committees were presented by C. E. Davies, secretary of the Society. He also presented for the record the report of the Finance Committee and statements of property owned, inventories, and purchase of securities as required by the Society's Constitution and by the statutes. The names of new members added and of members deceased during the year were entered into the record.

Mr. O'Brien announced the report of the tellers of election of officers for 1948–1949 and declared these officers elected. He introduced all officers who were present at the meeting. (For biographical sketches of these officers see MECHANICAL ENGINEERING for August, 1947, pages 701 to 705.)

Mr. Davies presented the report of the tellers on the new publication plan and on constitutional amendments, both of which were submitted to letter ballot on September 25, 1947, and were favorably voted on by the members. The President declared both the new publication plan and the amendments to be in effect.

By unanimous vote the Annual Report of the Council and the reports of the committees were approved and all actions of the officers and the Council were ratified and approved.

C. E. LUCKE HONORED

At the Council Meeting on Monday afternoon a certificate of award in recognition of 40 years of service to the Oil and Gas Power Division was presented by President O'Brien to Dr. Charles Edward Lucke, Fellow of the Society "for his pioneering part in initiating the Professional Division idea, which has been so fruitful to the Society's growth and progress and in founding the first of these, now known as the Oil and Gas Power Division, which held its initial meeting February 11, 1908."

In presenting the certificate, President O'Brien read the following statement:

In 1903, a young man, Dr. Charles Edward Lucke, joined the staff of the mechanical-engineering department of Columbia University, which was headed by Prof. Frederick R. Hutton, then Secretary of the ASME. Through his influence, Dr. Lucke began an active interest in the Society, becoming an Associate Member in 1903.

The gas engine was then developing rapidly and Dr. Lucke realized the importance of having some activities at each of the Annual Meetings of ASME to exchange ideas and further the development of this prime mover.

Dr. Lucke solicited the aid of Henry L. Doherty, later of the Cities Service Co., and with his assistance was able to secure the attention of the officers of ASME and their permission to go ahead and bring together a group of engineers interested in gas power.

In 1907, at the first Annual Meeting of the Society to be held in the new Engineering Societies Building, a meeting was held on December 4 devoted entirely to gas power. Four papers were presented, including one by Dr. Lucke.

In view of the interest shown and largely through Dr. Lucke's efforts, a group got together after this meeting and petitioned the Society for permission under the Constitution to form a professional section devoted to gas power.

This group comprised seventeen members and eleven guests. Among them were such well-known engineers as R. H. Fernald, Fred R. Low, and H. H. Supplee. At the informal meeting, H. H. Supplee was chosen secretary and asked to present the matter to Council. The time was opportune, as the keynote of President Hutton's address at the Annual Meeting of 1907 was the desirability of broadening the range and usefulness of the Society.

Council cordially received the petition and immediately appointed a Committee on Affiliated Societies to suggest rules for the government of professional sections. This committee consisted of F. R. Hutton, chairman; H. H. Supplee, R. H. Fernald, and F. W. Taylor. The rules drawn up by the committee were submitted to Council on Jan. 14, 1908. At that meeting, Council approved the rules and the way was clear for formation of the first professional section, or division, as such groups are now known.

The Gas Power Section was then formally organized and held its first regular meeting at the February monthly meeting of ASME in 1908. Dr. Lucke was unanimously elected chairman of the new section, to serve one year from Dec. 6, 1907. The first executive committee consisted of R. H. Fernald, G. I. Rockwood, F. H. Stillman, F. R. Low, and H. H. Supplee. After the business meeting, Dr. Lucke presided at a technical session at which four papers, including a pioneering discussion of gas turbines, were presented.

Thus largely through Dr. Lucke's efforts, the first professional division of the Society was formed. Soon other divisions followed and the influence and usefulness of the Society were greatly broadened. Over the years, the professional divisions have come to be a major force in forwarding the technical activities of ASME and it is thus fitting, on the 40th anniversary of the beginning of this movement, to recognize the contribution of Dr. Charles Edward Lucke to this fruitful development in ASME activities.

In receiving the certificate Dr. Lucke said that he was glad that the "professional-division idea" was being honored as it provided the key to the technological connection between the scientist and the technician and mechanic. It was important, he said, that professional unity be brought about by the formation of professional divisions in ASME as it was by such means that the engineer was able to act as the interpreter between the scientist and the technician.

CHARLES E. LUCKE ADDRESSES COUNCIL AFTER RECEIVING AN ILLUMINATED SCROLL HONORING HIS SERVICE TO THE SOCIETY

On Tuesday morning, at the first session of the Oil and Gas Power Division, Edgar J. Kates, member of the Council and chairman of the session, read the citation and exhibited the certificate. Dr. Lucke was greeted with enthusiastic applause and spoke briefly. He called attention to the fact that he was also one of the founders of the Heat Transfer Division, and he offered several suggestions to the Oil and Gas Power Division. He urged the division to maintain high professional and technological standards in the papers it presented and in the discussion of them, as otherwise a process of disintegration, noticeable to a certain extent already, would gain headway. The Division could not stand alone, he asserted, and hence it was important to co-operate with other groups in ASME and with other societies when problems of common interest arose. As examples of groups with which co-operation should be extended he cited the Power Division, the Gas Turbine Power Division, the automotive industries, and scientific persons and societies.

At the Heat Transfer Luncheon on Tuesday noon, Dr. Lucke was also the guest of honor and the principal speaker. Carl F. Kayan, chairman of the Heat Transfer Division, presided and introduced Dr. Lucke. The address delivered to the Heat Transfer Division will be found elsewhere in this issue.

LUNCHEONS AND DINNERS

Speaking at the Keynote Luncheon on Monday noon on the subject, "The Engineer's Place in World's Affairs," Earle O. Shreve, member ASME and president of the Chamber of Commerce of the United States, said that the engineer, more than men of other professions must today apply his knowledge to the solution of problems once far outside the scope of his responsibilities.

"The engineers of freedom," he declared, "are working for peace, whether they forge weapons of war or tools of peace.

Courtesy Chalfonte-Haddon Hall Hotel

E. O. SHREVE ADDRESSES KEYNOTE LUNCHEON, M. M. BORING, WHO PRESIDED, IS SHOWN AT RIGHT

They are working to beat a deadline of chaos. For the democracies must be strong if peace is to be obtained."

However, he pointed out "the engineers of destruction are also assiduously at work." He warned his audience about the threat of communism in the world and said that "the successes of the so-called Marshall Plan are a threat to present-day Russian ideology." As a result of recent firsthand observations in Europe, Mr. Shreve said that he had returned with the conclusion "that the tide of communistic influence west of the iron curtain has been dammed."

"In the hands of the engineer, with all the resources of his country to fortify his achievement, rests the future," he asserted in his conclusion. "The engineer's creative thinking, the engineer's logic, and the engineer's accomplishments are the sinews upon which this country must depend. It is a great responsibility for any profession or group of men. But it is a responsibility that America must ask of her engineers, and her scientists. And it is a responsibility which they are ready in full measure to accept."

GENERAL DINNER

A general dinner preceded by a complimentary cocktail party provided an enjoyable evening for 250 guests on Tuesday. The entertainment was highlighted by two showings, through the courtesy of *Life* magazine, of a new type of slide-film picturama entitled "The New America of 1947." The film depicted a picture story of today's America, appraising its economy, its industrial capacity, and its spirit. Each of the 127 panoramic sequences shown consisted of five individual photographs. The story was narrated by George A. de Holzer, *Life* staff member, and music, especially composed by Paul Creston, was played from records.

HYDRAULIC OLDTIMERS DINNER

The second annual Hydraulic Oldtimers Dinner held on Tuesday once again proved to be an entertaining and enjoyable evening for those able to attend. This year, however, there was no formal program but instead many of the hydraulic engineers present were called upon to say a few words. They told stories, related humorous anecdotes, and expressed their good wishes. Among the notables who spoke, were Dr. Norman S. Gibson, 1946 Holley Medalist, Richard Hearn, Earl Martin, Prof. Lewis F. Moody, Blake R. Van Leer, Captain Logan S. Ramsey, USN, and H. Birchard Taylor.

Since there was no honorary guest the group in attendance nominated Raymond D. Johnson, pioneer in hydraulic engineering and this year's Holley Medalist, as guest of honor in absentia.

S. Logan Kerr, member ASME, president, S. Logan Kerr and Co., Inc., Philadelphia, Pa., presided.

NUCLEAR ENERGY LUNCHEON

More than 550 in attendance at the Nuclear Energy General Luncheon on Tuesday heard David E. Lilienthal, chairman, U. S. Atomic Energy Commission, declare that plants for producing fissionable uranium and plutonium are going through such a large-scale improvement and expansion program that the next few years may double expenditures made up to now in atomic energy. He also stated that the use of atomic energy for the commercial production of power will not come for some time. The text of Mr. Lilienthal's address, "Atomic Energy and the Engineer," appears on pages 8 to 11 of this issue. Alex D. Bailey, fellow and past-president ASME, vice-president, Commonwealth Edison Co., Chicago, Ill., presided.

HEAT TRANSFER LUNCHEON

The Heat Transfer Division marked its 10th Anniversary at a luncheon on Tuesday, December 2, at which Dr. Charles E. Lucke, Fellow ASME, professor-emeritus of mechanical engineering, Columbia University, was honored as the man who served the Division as its first chairman and one whose initiative was primarily responsible for the professional division structure of the Society.

C. F. Kayan, who presided, reviewed the events which led to the organization of the Division in 1908 and described the ceremony at the meeting of the Council at which Dr. Lucke was presented an illuminated scroll in recognition of his services to the Society. (See page 63 of this issue.)

Dr. Lucke addressed the meeting on the topic, "Heat Transfer in Industry," in which he defined the function of the Division as one which provides factual information for the industrial designer who is faced with the problems of meeting the needs of the operator and manufacturer. With a background of more than 40 years in the field, Dr. Lucke admonished engineers of complacency in their work. Too much misinformation on heat-transfer problems is in circulation. The Division is responsible for making the facts known. It needs to fill the gaps in available information. He warned of misuse of the Division by theorists who tend to overlook important current problems. The designer is the key man of industry and the division should direct its efforts to give him the working facts he needs. Dr. Lucke's talk is published on pages 11 and 12 of this issue.

Following Dr. Lucke's talk Mr. Kayan, retiring chairman, was presented a certificate of award in recognition of ten years of service to the division.

FUELS DIVISION LUNCHEON

The annual dinner of the Fules Division held on Tuesday, December 2, was attended by more than 300 members and guests. President-elect E. G. Bailey presided. In a series of anecdotes, Mr. Bailey illustrated how the coal industry in the last 40 years has changed its position from one of no interest in efficient coal utilization to one which supports vast research projects touching upon the whole economy of the country. In contrast to its color, the future of coal is bright, he said.

DAVID E. LILIENTHAL IS INTERVIEWED AT THE NUCLEAR ENERGY GENERAL LUNCHEON

Mr. Bailey introduced Fred S. McConnell, president of the National Coal Association, Washington, D. C., and of the Enos Coal Mining Company, Cleveland, Ohio, who spoke on "The Coal Industry Looks Ahead." The expanding industries of electric power, steel, and chemicals as well as the future synthetic-fuels industry, all of which have their basis in coal, make the future of coal bright, he said. The bituminous-coal industry is on the threshold of a technological revolution which will expand its usefulness to industrial civilization. He cited the experimental development of the coal-burning gas-turbine locomotive, the first unit of which will be ready for rail testing late in 1948, as a potentiality in the stationary and marine power fields.

The national production for the calendar year 1947, Mr. McConnell said, will be a peacetime record of more than 600 million tons, about 80 million tons more than in 1946.

MANAGEMENT LUNCHEON

The General Luncheon on Thursday sponsored by the Management Division, was highlighted by the presentation of the 1947 Gantt Medal to Alvin E. Dodd, ASME fellow, president, American Management Association, for "his leadership in stimulating greater recognition and acceptance of the social responsibilities of management and for his success in building the American Management Association into an authoritative forum for collecting, analyzing, and disseminating management knowledge." The medal was presented to Mr. Dodd by Harold V. Coes, acting chairman, Gantt Medal Board, Fellow and past-president ASME, vice-president, Ford, Bacon & Davis, Inc., New York, N. Y.

President O'Brien, who presided at the luncheon, presented a certificate of award for service on the ASME Management Division, to John A. Willard, member ASME, partner, Bigelow, Kent, Willard, and Company, New York, N. Y.

John M. Hancock, chairman of the board, American Management Association, partner, Lehman Brothers, New York, N. Y., introduced Mr. Dodd for the presentation.

In his address Mr. Dodd said, "In many countries where management has failed to provide its employees with adequate nonfinancial incentives, the union movement has obtained recognition of its members' noneconomic aims at the political polls. If our employees are to continue to accept our economic way of life, we need to integrate our interests with theirs.

"I believe that the most important single development in the business of the future will be a share for employees in many of the work satisfactions now enjoyed largely or exclusively by those rather high up in management.

"Active group participation by employees in specific areas where they can make a real contribution is one of the mainsprings of industrial peace. It gives employees a more direct concern with the source of their livelihood. They become more responsible on the job if they participate in accident and waste reduction, better attendance and training, control of quality and maintenance, improvement of discipline and job attitude. Employees become more interested in their jobs if they are consulted and rewarded for their ideas on the job. Employees might be less opposed to new methods and other technical changes if these changes were explained, if the fact that they reduce strain and fatigue was made clear. Employees might show better understanding of their jobs if they knew more of management's aims and policies, the economics of the company and industry, if management knew more of what the worker really thinks. If we proceed gradually and in mutual good faith, we may yet develop a pattern for industrial peace."

WOOD INDUSTRIES DINNER

The elements and operations of a new high-frequency molding process, known as Raytronic, as distinct from the bag-molding and "cooking" method employing an autoclave with steam heat and pressure, were described by P. H. Bilhuber, member ASME, vice-president, Steinway & Sons Inc., New York, N. Y., at the annual Wood Industries Dinner held on Friday evening.

Mr. Bilhuber pointed out that considerable economics in first cost, equipment, maintenance, and floor space can be made by the adoption of this method to much larger structures of plied or laminated veneers such as half-fuselages and parts for airplanes, boat hulls, furniture, and the like.

Mr. Bilhuber's paper, "High Frequency Molding: Method Applied to Compound Curvatures in Wood," will be published in a forthcoming issue of MECHANICAL ENGINEERING

C. B. Lundstrom, member ASME, owner, Lundstrom Laboratories, Inc., Little Falls, N. Y., presided at the dinner and Thomas D. Perry, member ASME, consultant, Moorestown, N. J., acted as toastmaster.

ROCKET DINNER

The American Rocket Society held its second annual dinner on Thursday evening of the 1947 ASME Annual Meeting marking the second year of affiliation of the ARS and ASME. William Gore, director of government operations, Aerojet Corporation, Azusa, Calif., acted as toastmaster, and Roy Healey, president, ARS, senior project engineer, M. W. Kellogg Company, Jersey City, N. J., was chairman.

Mr. Gore announced the establishment of the following three annual awards to be made by the American Rocket Society:

The Robert H. Goddard Memorial Lecture—an award, medal, and certificate to a leader in the field of jet propulsion selected by the ballots of the American Rocket Society membership from a list of nominees selected by the Board of Directors.

The C. N. Hickman Award—a cash award, medal, and certificate to a senior member of the American Rocket Society for an outstanding contribution in the field of jet propulsion.

The ARS Junior Award—a cash award, medal, and certificate to a junior member of the American Rocket Society for the presentation of an outstanding paper on jet propulsion.

Dan Kimball, executive vice-president, Aerojet Corporation, the principal speaker of the evening, chose for his subject, "The Present and Future of Rockets," in which he reviewed the present status of rocket development work in the United States. He said that with the war production emphasis removed, it is evident that the progress of the rocket industry must hinge on the importance assigned to military preparedness. Commercial and scientific applications will grow in magnitude, but the conclusion appears inescapable that these activities cannot offer adequate support for the needed basic development. This condition might be considered typical of war-born industries which later find important and self-sustaining peacetime applications.

As to the future of the rocket industry, Mr. Kimball stated that although the commercial applications of rocket power are being developed to the fullest extent, it is evident that the industry at its present stage would be capable of only the barest subsistence without the support of military developments.

He stated further that it is quite conceivable that the next few years will see all large-scale gunnery give way to rocket projectiles and missiles. The "guns" which do remain may be in the nature of cylinder catapults powered by rocket propellants. The development of new fuels, particularly water-reactive chemicals, presents an unlimited field of possibility for the propulsion of Naval craft and weapons.

It seems entirely compatible with the requirements of national preparedness that special emphasis be given scientific and explanatory ventures which make use of the same type of rockets employed in long-range weapons. Vehicles which will be powered to attain or approach the gravitational escape velocity have possibly more immediate military significance than scientific application; certainly their commercial significance is far in the future.

The ARS also participated in four technical sessions, two of which were held jointly with ASME.

ROCKET LUNCHEON

Col. Marvin C. Demler, Washington, D. C., chief of the flight propulsion branch of the United States Air Force (Directorate of Research and Development) spoke Friday at the Rocket Luncheon sponsored by the American Rocket Society, ASME affiliate. Lovell Lawrence, Jr., a past-president of ARS, acted as toastmaster.

Colonel Demler's remarks were directed toward "what the Air Force hopes to accomplish in the field of rocket propulsion." He revealed that rocket propulsion is now an essential phase of our aircraft and missiles program, specifically as follows: To conduct research in supersonic aerodynamics with rocket-propelled aircraft and missiles; to improve JATO units for all aircraft types; to develop rocket booster engines for high-rate-of-climb interceptor type of aircraft and for boosting aircraft through the transsonic speed range; and to develop for operating use supersonic aircraft and guided missiles powered by jet and rocket engines.

Colonel Demler pointed out that the development of our air missiles involves many problems still to be solved by the rocket engineer. The dependability of rocket motors and boosters must be such that their performance can be accurately predicted. Missile testing, differing from aircraft testing in which the pilot can report on a flight, must be successful in every particular if the flight-test data are to be made available to design engineers and the program carried forward. Stability of rocket fuels in storage is a very important factor in missile operation. Rocket booster devices require propellants which will not deteriorate or decompose over prolonged periods of time in storage. Rocket booster devices and their propellants must be designed for use on aircraft capable of operating from advanced bases in remote areas and under severe climatic conditions. Further, both solid and liquid propellants must be capable of being transported and easily maintained in a state of readiness for use. So far, these problems do not appear easy of solution.

Within the next five years the Air Force looks toward the development of rockets and jet devices having greater endurance, he stated. This is based upon improved fuels having a higher specific impulse, materials capable of withstanding higher temperatures, and cooling methods which do not impair thermodynamic cycles. From an industrial mobilization standpoint, it is extremely important that propellant research and development be conducted around chemicals and materials available in large quantities.

In conclusion, he said that the Air Force realizes that rocket-engine research and development depends almost entirely on the military service for its sustenance. It is necessary also, that this new industry be supported with sufficient funds to provide adequate test facilities. Personnel technically competent to perform the new and difficult techniques of rocket development are needed in increasing numbers. Colonel Demler suggested that the establishment of fellowships for postgraduate basic research in rocket and jet propulsion be given serious consideration by industrial and educational foundations. Further, basic research in the fundamentals of rocket design, chemical research, and other allied problems should be supported to provide a foundation for this country's future needs.

1200 ATTEND ANNUAL BANQUET

The 68th Annual Dinner of the ASME was held on December 3, 1947, in the Wedgewood Room of the Haddon Hall Hotel. Twelve hundred members and guests witnessed the impressive ceremonies during which the Society conferred honors and awards on distinguished engineers and paid tribute to the leadership of its senior members and officers.

Blake R. Van Leer, president, Georgia School of Technology, Atlanta, Ga. was toastmaster. Seated with him on the dais were, Eugene W. O'Brien, retiring president ASME; E. G. Bailey, president-elect, ASME; recipients of the 1947 honors and awards, and honored guests.

President O'Brien extended a welcome to distinguished guests from other countries who were in the audience and introduced those who were to assist him in the presentation of awards.

On the occasion of the Annual Meeting the Society honors members who during the past year have completed 50 years of membership in the ASME.

President O'Brien read the names of 17 members who now joined the Fifty-Year Members of the ASME, a distinction marked with a special medal. These members were: Henry Bartlett, Edward L. Bateman, Edwin S. Boyer, A. L. Burgan, Edward S. Cole, James Craig, John T. Faig, James H. Herron, Ward S. Jacobs, Samuel H. Libby, Lionel S. Marks, Charles A. Morse, Peter C. Patterson, William G. Starkweather, George A. Tibbals, Henry Torrance, and Benjamin F. Wood.

Of these, Ward S. Jacobs, Lionel S. Marks, and William G. Starkweather were present and were asked to stand to receive the applause of the audience. President O'Brien explained that James H. Herron had received the 50-year medal of the Society at the 1947 Semi-Annual Meeting in Chicago and that the other members would have the medal presented to them in person at meetings throughout the coming year held in their own communities where they can be honored by friends and neighbors.

President O'Brien then introduced Arthur L. Williston who was attending the annual banquet for the fiftieth consecutive year.

OTHER AWARDS

President O'Brien turned next to the presentation of honors and awards. He called upon Lawrence W. Wallace, Fellow ASME, to read the citations and upon Charles M. Allen, Fellow ASME and James M. Todd, Fellow ASME, members of the ASME Medals Committee, to serve as marshals.

As the awards were announced, the marshals escorted the recipients to the center of the dais where the citation was read and each received from the president such certificates or medals as the award provided.

President O'Brien announced that the following awards had been presented at the Members and Students Luncheon held at noon, Wednesday.

Charles T. Main Award to ALVARO R. BOERA, graduate of Stevens Institute of Technology, Hoboken, N. J., for his paper.

DAVID COCHRAN (LEFT), PI TAU SIGMA MEDALIST, AND WILLIAM R. COLLIER (RIGHT) UNDERGRADUATE AWARD RECIPIENT

J. P. DEN HARTOG (RIGHT) RECEIVES RICHARD MEMORIAL AWARD FROM PRESIDENT O'BRIEN

"The Engineering Method—Its Value and Limitations." This award is bestowed on the author of the best paper within the general subject of the influence of the profession upon public life. The exact subject is assigned annually.

Undergraduate Student Award to WILLIAM R. COLLIER, student member ASME, Tufts College, for his paper, "Corrosion—A Design Problem." The award is given for the best paper submitted by a student member during 1947.

BIOGRAPHICAL SKETCHES

Biographical sketches of the recipients follow:

ALVARO RICHARD BOERA, 22 years old, is an employee of the Glenn L. Martin Aircraft Company, Baltimore, Md. His studies in mechanical engineering at Princeton University were interrupted when he entered the naval reserve in 1943 as an apprentice seaman. After receiving a commission as ensign in 1945 he served on the U.S.S. Portsmouth in the Atlantic and Mediterranean areas. Upon discharge he returned to Stevens to continue his studies and was graduated in 1947. His paper was written while he was a student member of the Society. He is a member of Tau Beta Pi.

WILLIAM ROBERT COLLIER is a 25-year-old veteran whose studies at the University of Cincinnati were interrupted by service with the U. S. Army in the Asiatic-Pacific theater. He is a student of Tufts College and will be graduated in February, 1948.

Recipients of the other awards were as follows:

GILBERT T. ROWE, Jun. ASME, Douglas Aircraft Company, Santa Monica, Calif., awarded the Junior Award for his paper, "A Correlation of Measured and Predicted Flow Characteristics of an Aircraft Ram Air Duct System."

DAVID COCHRAN, Jun. ASME, atomic-power division, General Engineering and Consulting Laboratory, General Electric Co., received the Pi Tau Sigma award for outstanding achievement in mechanical engineering within ten years after graduation from a regular four-year mechanical-engineering course.

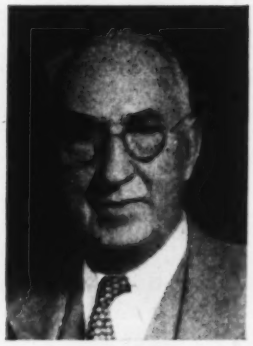
JACOB P. DEN HARTOG, member ASME, professor of mechanical engineering, Massachusetts Institute of Technology, Cambridge, Mass., awarded the Richards Memorial Award for outstanding achievement in mechanical engineering within 20 to 25 years after graduation from a regular four-year course in mechanical engineering. This award is endowed by the Pi Tau Sigma fraternity.

Recipients of Medals and Awards

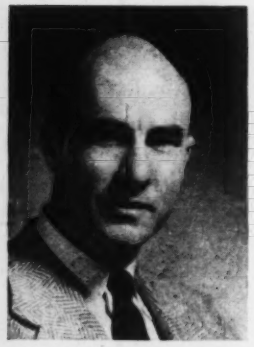
PAUL W. KIEFER
ASME Medal

RAYMOND C. MARTINELLI
Melville Medal

ARPAD L. NADAI
Warner Medal



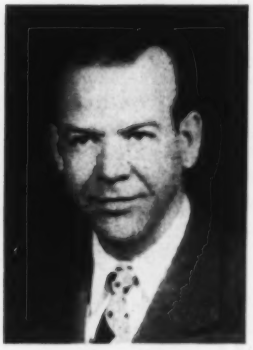
RAYMOND D. JOHNSON
Holley Medal



JACOB P. DEN HARTOG
Richards Award

ALVIN E. DODD
Gantt Medal

JOHN K. NORTHROP
St. Louis Medal



HARRY H. HAUGER, JR.
St. Louis Junior Award

WILLIAM R. COLLIER
Undergraduate Award

DAVID COCHRAN
Pi Tau Sigma Medal

GILBERT T. ROWE
Junior Award

ALVARO R. BOERA
Main Award

HARRY H. HAUGER, JR., Jun. ASME, Douglas Aircraft Company, Pasadena, Calif., awarded the Spirit of St. Louis Junior Award for his paper "Thermal Anti-Icing of the Eagle Airfoil." This award is presented every three years for the best paper on an aeronautic subject presented by a junior member of the Society.

JOHN K. NORTHROP, president and chief engineer, Northrop Aircraft, Inc., awarded the Spirit of St. Louis Medal for originality and vision in the engineering of military and commercial airplanes and particularly for the development of a successful flying wing. The presentation of this award took place at the ASME 1947 Fall Meeting in Salt Lake City, Utah.

RAYMOND C. MARTINELLI, Jun. ASME, General Engineering and Consulting Laboratory, General Electric Company, Schenectady, N. Y., awarded the Melville Medal for his paper, "Heat Transfer to Molten Metals." Established in 1914, this award is made to the author of an original paper of exceptional merit presented to the Society for discussion and publication, to encourage excellence in papers.

ARPAD L. NADAI, member ASME, consulting engineer, Westinghouse Research Laboratories, Pittsburgh, Pa., awarded the Worcester Reed Warner Medal for his pioneering contributions to the theory of plasticity. This award is bestowed for outstanding contributions to permanent engineering literature.

RAYMOND D. JOHNSON, hydraulic engineer, formerly associated with the N. Y. State Water Power Commission, was awarded the Holley Medal in recognition of his work as a "pioneer in hydraulic engineering, master of fluid acceleration, accelerator of engineering progress." This award is bestowed occasionally for some "great and unique act of genius of engineering nature that has accomplished a great and timely public benefit."

PAUL W. KIEFER, Fellow ASME, chief engineer of motive power and rolling stock, New York Central System, was awarded the ASME Medal for outstanding achievement in railway transportation. Established in 1920, the ASME Medal is bestowed in recognition of distinguished service in engineering and science.

Of those honored, Mr. Rowe and Mr. Johnson were not present to receive the honor in person.

Brief sketches of the achievements of the medalists follow:

GILBERT THORNTON ROWE, recipient of the Junior Award has been a junior member of the Society since 1945. He was born in Los Angeles, Calif., in 1921 and was graduated from the University of California at Los Angeles in 1943. Upon graduation he was employed in the air-condition group of the engineering department, Douglas Aircraft Company, Santa Monica, Calif. Since 1945 he has worked as a designer and assistant leadman for technical design. He is a member of Tau Beta Pi.

DAVID COCHRAN, recipient of the Pi Tau Sigma Award, is division engineer in charge of the atomic-power division of the General Engineering and Consulting Laboratory of the General Electric Company. Following his graduation from the Montana State College in 1938, he worked for several months at the Fort Peck Dam project in northeastern Montana. In 1939 he entered the General Electric Test Department where he completed a three-year advanced course in engineering. He did analytical and experimental work on the temperature distribution in supercharger turbine buckets and participated in research and development related to the detection of underwater objects. He is a member of Tau Beta Pi and Phi Kappa Phi and a junior member of the Society.

JACOB P. DEN HARTOG, winner of the Richards Memorial Award, was born in Ambarawa, Java, Dutch East Indies, in 1901. Following graduation from the Polytechnic University of Delft, Holland, he came to the United States and was employed by the Westinghouse Electric Corporation. Evening studies at the University of Pittsburgh brought him a Ph.D. degree in 1929.

Dr. Den Hartog became assistant professor of applied mechanics at the Harvard Engineering School in 1932, and was associate professor from 1936 to 1931. After four years with the U. S. Navy, first in the Bureau of Ships and later with the U. S. Naval Technical Mission in Europe, he became a professor at the Massachusetts Institute of Technology in 1945. He is now in charge of the applied mechanics division of the department of mechanical engineering.

Dr. Den Hartog is the author of a book on mechanical vibrations and has contributed many papers and book reviews to Society publications.

HARRY HOYT HAUGER, JR., recipient of the Spirit of St. Louis Junior Award was born at Pasadena, Calif., in 1919. Following his graduation from the California Institute of Technology in 1942, he worked two years for the Douglas Aircraft Company, Santa Monica, Calif., before entering the Armed Forces. In 1946 after two years at Wright, Field, Dayton, Ohio, during which he served as chief of the heating, cooling, and ice-prevention systems subunit, he returned to the Douglas Aircraft Company. He is now design engineer in the air-condition group of that company.

JOHN KNUDSEN NORTHROP, recipient of the Spirit of St. Louis Medal has been president and chief engineer of the Northrop Aircraft, Inc., since 1939. He is one of the few leaders of the aviation industry who can design and build an airplane with his own hands and then fly it. Because of his originality and vision in the engineering of military and commercial aircraft, he has been called one of the great creative designers of our time. He has been primarily responsible for such landmarks in aviation as the Vega, Northrop Alpha, Delta, and Gamma series, the A-17 attack planes and the early Navy dive bombers. His greatest achievement is the Flying Wing, the most radical large plane every built. It is recognized as a milestone in the history of aviation.

Mr. Northrop was born in Newark, N. J., in 1895. Most of his engineering education was acquired in the service of early aircraft manufacturers. In 1932 he organized his own company and served as vice-president and chief engineer. In 1939 the original company was reorganized and he was made president. Mr. Northrop is a fellow of the Institute of the Aeronautical Sciences.

RAYMOND CONSTANTINE MARTINELLI, recipient of the Melville Medal, was born in Lucca, Italy, in 1914. His studies at the University of California, Berkeley, Calif., in mechanical and electrical engineering led to a Ph.D. degree which he received in 1941.

Since 1938 Dr. Martinelli has served in many capacities as research engineer with the Shell Oil Company and the Associated Oil Company; as professor at the University of California; as designer with the Douglas Aircraft Company. During the war he was associated with many projects of the National Advisory Committee for Aeronautics, Office of Scientific Research and Development, and the Army Air Forces. On leave from the University, he is now with the general engineering and consulting laboratory of the General Electric Company.

Dr. Martinelli is a member of the Tau Beta Pi, Phi Beta Kappa, Sigma Xi, the Mohawk Association of Scientists and Engineers, and a junior member of the Society.

ARPAD LUDWIG NADAI, recipient of the Worcester Reed Warner Medal, has been chairman of the ASME Research Committee on Plastic Flow of Metals since 1939. He is an authority on the theory of plasticity and his many articles and books on analysis of the phenomena associated with plastic flow, has influenced the direction of research in mechanics of plastic materials.

Born in Budapest, Hungary, in 1883, Dr. Nadai received his engineering education at Swiss and German universities where he studied under such great teachers as Dr. Aurel Stodola, Dr. Eugene Meyer, and Dr. L. Prandtl.

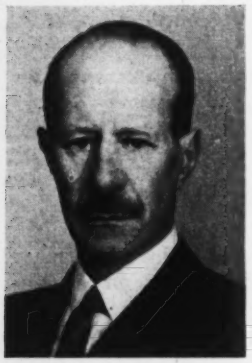
In 1927, Dr. Nadai was invited by the University of Pittsburgh and the Westinghouse Research Laboratories to present a series of lectures on elasticity and plasticity. Since that time he has remained in this country serving as consultant to the Westinghouse Electric Corporation and lecturing at several universities.

At the request of the U. S. Navy, Dr. Nadai helped solve the problem of ship fractures during World War II. Since 1943 he has served as consultant to the David Taylor Model Basin.

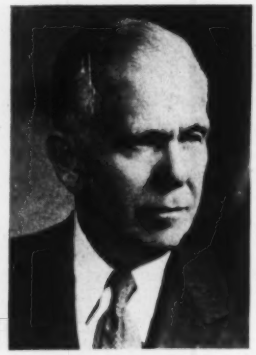
RAYMOND D. JOHNSON, sixteenth recipient of the Holley Medal, was honored for his important studies in hydraulic flow with special reference to inertia effects, accelerated flow in open channels and closed conduits, and the application of new principles to hydraulic structures.

Mr. Johnson was born in Orchard Park, N. Y., in 1874 and was graduated from Cornell University in 1895. Most of his professional life was spent in the field of hydraulic engineering. He was resident engineer during the construction of the works of the Shawinigan Water and Power Company, Shawinigan Falls, Quebec, Canada. As chief engineer of the Ontario

Made Honorary Members of the ASME



LORD DUDLEY GORDON
Honorary Membership



GEORGE C. MARSHALL
Honorary Membership

EVERETT G. ACKART
Honorary Membership

FRANCIS HODGKINSON
Honorary Membership

HARVEY N. DAVIS
Honorary Membership

Power Company he helped to lay out the work for the Winnipeg Municipal development. He served as consultant in the development at Feather River, Calif., and was hydraulic engineer for the N. Y. State Water Power Commission.

In 1922, Mr. Johnson received the Elliott Cresson Gold Medal for Meritorious Invention. He is now retired and living in Fort Lauderdale, Fla.

PAUL WALTER KIEFER, recipient of the ASME Medal, is an eminent engineer, executive and pioneer in the development of road capacity testing of steam locomotives. He is a member of the Executive Committee of the Railroad Division, a Fellow of the Society and author of many papers on motive power and rolling stock. In 1946 he received an honorary degree in mechanical engineering from the Stevens Institute of Technology, Hoboken, N. J.

Mr. Kiefer studied engineering at the night school of the Cleveland YMCA, the Central Institute, Cleveland, Ohio, and later continued an intensive night-study course in locomotive and car design in New York. As part of his training he completed a four-year machinist apprenticeship at the Collinwood locomotive shop of the Lake Shore and Michigan Southern Railroad Company.

From 1916 to 1918 Mr. Kiefer was locomotive designer and leading draftsman in the Office of Mechanical Engineer of the New York Central System. He served in various capacities of increasing responsibility and in 1926 became chief engineer of motive power and rolling stock in charge of the equipment engineering department.

FIVE HONORARY MEMBERSHIPS CONFERRED

President O'Brien turned next to the presentation of certificates of honorary membership to five distinguished members of the profession. He explained that the certificate of honorary membership has been presented to LORD DUDLEY GORDON, chairman, J. & L. Hall, Ltd., Dartford, England, at the centennial celebrations of The Institution of Mechanical Engineers in London in June 1947. Lord Dudley Gordon, is president of the Institution. President O'Brien expressed the regret of the Society that GENERAL GEORGE C. MARSHALL also elected to honorary membership was unable to attend the banquet because of urgent business in London. He then proceeded with the presentation of certificates to the following:

EVERETT G. ACKART, Fellow ASME, chief engineer, E. I. du Pont de Nemours and Company, Wilmington, Del.

FRANCIS HODGKINSON, Fellow and past vice-president ASME, consulting engineer, New York, N. Y.

HARVEY N. DAVIS, Fellow and past-president ASME, president, Stevens Institute of Technology, Hoboken, N. J.

Brief sketches of the engineers thus honored follow:

LORD DUDLEY GORDON

LORD DUDLEY GORDON, president of The Institution of Mechanical Engineers, is engaged in refrigeration-machinery manufacture and installation. He is an authority on refrigeration and is generally responsible for the land-type refrigerating installation developed by J. & E. Hall, Ltd., Dartford Iron Works, Dartford, England, of which he is chairman.

Lord Gordon was educated at Cargifield, Edinburgh, and at Harrow. Leaving Harrow in 1902, he became an apprentice at the Hall, Russell & Co. shipyard, Aberdeen. His training was continued in the Engineering Department and on the technical staff of W. H. Allen, Sons & Co., Ltd., Bedford. He joined J. & E. Hall in 1907, and following a period of training in the shops and on outside erection work, became a member of the staff in 1909, a director in 1910, a managing director in 1919, and chairman in 1937.

He is a director of Barclays Bank, Phoenix Assurance, and The Industrial & Commercial Finance Corp., and chairman of Hadfields, Ltd. He served as president of the British Association of Refrigeration, 1926–1929, of the British Engineers' Association, 1936–1939, and of the Federation of British Industries, 1940–1942. In 1942 he gave the twenty-ninth Thomas Hawksley Lecture of The Institution of Mechanical Engineers, entitled "Recent Developments in Refrigeration."

GENERAL GEORGE C. MARSHALL

For his distinguished services in military science and as Chief of Staff and General of the Army during World War II, GENERAL GEORGE CATLETT MARSHALL has been made an honorary member of the Society.

General Marshall was born in Uniontown, Pa., in 1880 and attended Virginia Military Institute, the U. S. Infantry-Cavalry School, and the Army Staff College. He has honorary degrees from Washington and Jefferson, Pennsylvania Military, William and Mary, and Trinity Colleges, and Norwich University.

Commissioned a second lieutenant in the infantry in 1901, he was promoted through the grades to major general in 1939. He was aide to General Pershing, 1919–1924; then served in China; instructed at the Army War College; was assistant commandant, Infantry Schools; commanded the Eighth Infantry; was senior instructor to the Illinois National Guard; was commanding general of the Fifth Brigade, U. S. Army; Chief of War Plans Division of the General Staff; Deputy Chief of Staff, U. S. Army; Acting Chief of Staff; Chief of Staff with rank of general, and became General of the Army in December, 1944. He was chief of the military mission to Brazil in 1939, and was appointed Ambassador to China by President Truman in November, 1945.

General Marshall has been awarded the Distinguished Service Medal, Silver Star, and Victory Medal with five bars by the United States, and holds honorary awards from France, Montenegro, Italy, Panama, Ecuador, Peru, Morocco, Cuba, Chile, Great Britain, and Russia. He was awarded the Theodore Roosevelt Distinguished Service Medal of Honor for 1945.

PRESIDENT-ELECT E. G. BAILEY AND MRS. BAILEY

GENERAL VIEW OF SPEAKERS' TABLE AT THE ANNUAL BANQUET, WEDNESDAY, DEC. 3

EVERETT G. ACKART

Outstanding expansion and achievements of the Engineering Department of E. I. du Pont de Nemours & Co., Inc., over the past twenty years are evidence of the leadership, engineering ability, and judgment of EVERETT GUNNAR ACKART, chief engineer, who retired in 1946. Mr. Ackart, a Fellow of the ASME, was recently awarded the Newcomen Medal of The Franklin Institute "in consideration of his long and successful career of forty years in designing industrial steam plants."

Mr. Ackart was born in 1881 at Schaghticoke, N. Y. He was graduated from Troy Academy, obtained the Ph.B. degree from Wesleyan University in 1902, and the M.E. degree from Cornell in 1905.

In 1907, Dr. Ackart joined the Light, Heat, and Power Division of the du Pont company, being engaged principally in power work for explosives plants. This division was absorbed by the engineering department in 1915, and he played an important part in the company's outstanding war construction program, concentrating on power-plant design and plant-process efficiency studies. After the war he supervised mechanical experimental work, headed the design and operative divisions of the engineering department, was made assistant chief engineer in 1924, and advanced to chief engineer in 1927.

The chief engineer of du Pont manages the engineering department, which does all its design and construction work and manufactures special machinery; and supervises the industrial and development engineering divisions. Du Pont's performance in World War II was outstanding, approximately a billion dollars worth of construction work having been done for the government. Of this sum, $350,000,000 was expended on the Hanford Engineering Works, which was probably one of the greatest design and construction achievements of our time.

FRANCIS HODGKINSON

FRANCIS HODGKINSON, ASME vice-president, 1939–1941, and a Fellow since 1939, has been made an honorary member in recognition of outstanding achievement in the development of the steam-turbine prime mover, and many years of faithful efficient service to the Society. His genius as a designer, inventor, and constructor of steam turbines has been widely recog-

nized, as evidenced by his having been awarded many engineering honors.

Mr. Hodgkinson is honorary professor of mechanical engineering at Columbia University, and retired consulting engineer of the Westinghouse Electric Corporation. He was born in London in 1867 and educated at the Royal Naval School, the Department of Science and Art at New Kensington, and Durham University.

After serving as an apprentice with Clayton and Shuttleworth, agricultural-machinery and steam-engine builders, he was with Clarke, Chapman, Parsons & Co., builders of ship auxiliaries, including small turbine-electric generating sets, and the earliest Parsons steam turbines. In 1889, dissolution of the partnership brought about the incorporation of C. A. Parsons & Co., where Mr. Hodgkinson rose to superintendent of field construction, principally of Parsons steam turbines, in 1890 he served as an engineer officer in the Chilean Navy. Subsequently he was associated with a telephone and lighting engineer in Peru, then worked as a master mechanic for a Peruvian mining company.

Returning to England in 1894, he became shop superintendent of the Parsons Company, later designing steam turbines under the direction of Sir Charles Parsons. He was sent to the United States in 1896 to direct the design and construction of Parsons steam turbines at the Westinghouse Machine Company, which later became the machine works of the Westinghouse Electric & Manufacturing Co. He organized the turbine department of the latter company, became chief engineer in 1916, and was consulting mechanical engineer from 1926 until his retirement in 1936. He has been awarded more than one hundred patents.

HARVEY N. DAVIS

His early work and joint authorship with Lionel S. Marks of "Tables and Diagrams of the Thermal Properties of Saturated and Superheated Steam," and publication of textbooks on physics, as well as other publications and papers incident to his distinguished career as a scientist, engineer, and educator, have prompted the Society to confer honorary membership upon its Fellow and former president, HARVEY NATHANIEL DAVIS, president of Stevens Institute of Technology.

Dr. Davis was born in Providence, R. I., in 1881. He received the A.B. degree at Brown University in 1901 and the A.M. and Ph.D. degrees at Harvard in 1903 and 1906, respectively.

With N. H. Black, Dr. Davis is author of "Practical Physics" and "New Practical Physics." He also wrote a chapter of Beard's "Toward Civilization," and various papers on thermodynamics. He has a number of inventions to his credit, including an improvement in steam turbines, and five processes, with apparatus, for the liquefaction and rectification of air. He helped organize the first conference at Cambridge out of which the ASME steam research program grew. During World War I he was active in helium investigations conducted by the Army, Navy, and Bureau of Mines, and during the last war directed the Office of Production Research and Development of the War Production Board.

Dr. Davis is a former regent of the Smithsonian Institution, president of the American Association for Adult Education, honorary member of The Franklin Institute and The Institution of Mechanical Engineers, and a member of many leading engineering, scientific, and educational societies.

AT THE TEA DANCE, TUESDAY, DECEMBER 2

MRS. E. S. BRISTOL (RIGHT) SERVING AT THE TEA DANCE, TUESDAY, DECEMBER 2

THE GANTT GOLD MEDAL

This year it was the privilege of the Society to have the Gantt Gold Medal presented at its Annual Meeting. The presentation was made at a general luncheon on Thursday, December 4, sponsored by the ASME Management Division. An account of the presentation ceremonies is given on page 65.

This year the award was conferred on ALVIN E. DODD, president of The American Management Association, New York, N. Y. "for his leadership in stimulating greater recognition and acceptance of the social responsibilities of Management; and for his success in building the American Management Association into an authoritative forum for collecting, analyzing, and disseminating management knowledge."

The Gantt Gold Medal was established in 1929 through a fund raised by a group of Henry Laurence Gantt's friends to memorialize the achievement of this great management engineer, industrial leader, and humanitarian. It is presented annually for "distinguished achievement in industrial management as a service to the community."

ALVIN E. DODD

A brief account of Mr. Dodd's achievements follows:

ALVIN E. DODD was born at Hudson, N. Y., in 1883.. He received his bachelor of science degree from Armour Institute of Technology, Chicago, Ill. in 1905. After a few years in educational and social experimental work, he was named director of the National Society for Promotion of Industrial Education. In

this position he worked closely with President Wilson and Samuel Gompers of the AFL, and was largely responsible for passage of the Smith-Hughes Act which marked the inauguration of public vocational education with Federal sponsorship and financing. After World War I, he became director of the Retail Research Association and its successor, the Associated Merchandising Corporation.

In 1934 he became vice-president and the paid executive officer of the American Management Association. His work was so effective that, in 1936, for the first time in AMA's history, the presidency was made a full-time paid job and he was elected to the post.

In addition, he is vice-president of the National Institute of Sciences, a member of the Economic Policy Committee of the U. S. Chamber of Commerce, and the Information Committee of the Committee for Economic Development. Mr. Dodd's influence extends to management in the international field through his activities as a member of various committees of the National Management Council and his work with the International Committee for Scientific Management and the International Management Congress.

Mr. Dodd is credited with having influenced the thinking of American industry by his teaching of the scientific approach to the problems of management in administration, finance, insurance, distribution and marketing, production, sales, and personnel and industrial relations.

ACCENT ON YOUTH

Following the presentation of honors and awards, President O'Brien delivered the presidential address. He characterized his administration as one which placed the accent on youth and reviewed the actions that had been taken by the Society and the Engineers Joint Council in which the Society participates, to meet the needs of young engineers. Humanizing of the engineering profession with less accent on "rigid technical laws and inflexible formulas" and more on the ability to be averagely human, mix with and understand other people is the task that lies ahead for engineers, he said. President O'Brien's address is published on pages 5 to 7.

President O'Brien then introduced the new vice-presidents and directors at large by asking the following to stand: Frank M. Gunby, P. B. Eaton, T. E. Purcell, J. Calvin Brown, re-elected for vice-president, A. L. Penniman, Jr., W. M. Sheehan, and J. B. Armitage.

When all the new officers were standing they received the applause of the audience.

In his introduction of E. G. Bailey, president-elect ASME, President O'Brien said the Society was fortunate in having for its new president a man who is a world authority on coal utilization, an officer of two great American industrial organizations, and one who has had a long apprenticeship in the Society.

In taking office, Mr. Bailey outlined the work that lay ahead for the engineering profession. Today there is a shortage of nearly every line of engineering product, he said. Many products should be improved and produced more economically. There are new discoveries and inventions awaiting the engineers who have the ability to develop them for the mutual good. There is much to do to rebuild from the waste and destruction of the last war. To do this work, he said, our only sources of wealth are our natural resources and man-hours of effective effort.

Toastmaster Van Leer closed the dinner meeting with a few remarks after which a reception was tendered to the presidents and their wives, Mr. and Mrs. Eugene W. O'Brien and Mr. and Mrs. E. G. Bailey. Dancing then followed in the Vernon Room.

CITIZENSHIP

On Friday morning the Engineers' Civic Responsibility Committee, under the leadership of the chairman, Roy V. Wright, past-president and honorary member, ASME, conducted a round-table discussion on how to make best use of the proposed manual to stimulate interest in citizenship. Members of the committee and many other persons entered the discussion.

It was said, half seriously, that perhaps the committee needed a new name and "Committee on Survival" was suggested in view of the fact that inattention to the obligations and responsibilities of citizenship and indifference to the American way of life might jeopardize its survival in an era when other social and political doctrines were being advanced publicly and under cover.

It was thought that the so-called "yardstick" which the committee had devised—a questionnaire intended to direct the individual's attention to his own activities as a citizen—should be revised and that it would be more effective if some means of "grading" could be incorporated. Experiences in ways of stimulating interest in citizenship in various ASME sections were reported.

INDUSTRIAL FILMS

During each day of the meeting industrial films, many in color, were shown in the Viking Room, which is a fully equipped picture theater seating 500 people. The films were scheduled so that members could drop in for the showing of any particular film or for a moment's rest between technical sessions.

Considerable effort was devoted to the film program because industrial films not only supplement plant trips but convey information on industrial processes, manufacturing facilities, and the latest techniques which often cannot be fully appreciated during a tiring tour of a large plant. In the films this information is presented logically and entertainingly and under conditions which are restful and conducive to concentration.

Films have been included in the Annual Meeting programs of the past several years. If they are appreciated by members, much more can be done by way of encouraging manufacturers to prepare films for presentation to technical audiences, so that the Society's film program can become a more valuable service to members. While the attendance at the showings was encouraging, the Meetings Committee would like an expression of opinion from members who saw the films to determine whether further expansion of the program is justifiable.

PLANT TRIPS

On Monday, afternoon, the Missouri Avenue Plant of the Atlantic City Electric Company was host to 60 members and guests in attendance at the 1947 Annual Meeting. The visitors had the opportunity of seeing in operation a 30,000-kw General Electric turbine unit which operates with throttle steam at 1350 psi and 1000 F. This installation was placed in service in October, 1946, and brings the Atlantic City system up to 60,000 kw. A single Foster-Wheeler boiler rated at 310,000 lb per hr supplies the steam.

One of the features in the station is the positive automatic control of final steam temperature by a condenser heat exchanger in the saturated-steam line between the boiler drum and superheater inlet header. In addition radiant and convection superheaters tend to provide uniform temperature.

Approximately 50 took part in an all-day tour on Tuesday, through the Deerfield Packing Plant, Bridgeton, N. J., and the Armstrong Cork Company, Millville Plant, Millville, N. J.

The Deerfield Plant provided guides who explained the capacity and operating conditions of the refrigeration and steam-plant services as well as the facilities for harvesting

and processing vegetable products in preparation for freezing and canning operations. The group was conducted through the several operating and service areas where the machinery and facilities for processing, handling, freezing, and storage of these vegetable products were inspected.

At the Millville Plant of the Armstrong Cork Company the visitors saw the entire process for transferring raw materials to finished products such as laboratory glassware and commercial bottles. The group was conducted through the mixing rooms, furnace and forming rooms, and packaging and storage areas of the plant.

COMMITTEES IN CHARGE

Meetings of The American Society of Mechanical Engineers come under the general supervision of the Committee on Meetings and Program. The technical program is provided by the Society's professional divisions and technical committees. Other features are planned and supervised by committees organized within the Metropolitan Section. In grateful acknowledgment of the many committees whose efforts contributed so substantially to the success of the 1947 Annual Meeting their personnel is listed in what follows:

Meetings Committee: D. S. Walker, chairman, Paul W. Thompson, Glenn B. Warren, Wm. H. Kushnick, and Joseph W. Barker, with Henry J. Scagnelli and Arthur J. Hughes as junior advisers.

Board on Honors: Lawrence W. Wallace, chairman, Lewis F. Moody, James M. Todd, Charles M Allen, Clarke Freeman, and Ely C. Hutchinson.

Committee on Medals: Lawrence W. Wallace, chairman, Fred H. Colvin, Lawford H. Fry, Paul E. Holden, Frederick M. Feiker, Ernest L. Hopping, James M. Todd, Charles T. Ripley, Charles M. Allen, Nevin E. Funk, Warner Seely, Blake R. Van Leer, Joseph B. Ennis, Clarke Freeman, Benjamin P. Graves, Harry R. Westcott, Tomlinson Fort, Ely C. Hutchinson, Morrough P. O'Brien, and Robert M. Van Duzer, Jr.

General Committee, Annual Meeting: Eugene W. O'Brien, honorary chairman; C. W. E. Clarke, chairman; Allen W. Thorson, vice-chairman ; L. C. Bosler, treasurer, J. P. Clark, N. E. Funk, E. L. Hopping, K. M. Irwin, S. T. Mackenzie, D. W. R. Morgan, J. J. McCarthy, V. L. Sanderson, Albert Schade, 3rd, D. S. Walker, and Benjamin W. Webb.

Committee on Information and Reception: J. J. McCarthy, chairman, T. N. Graser, H. D. Harkins, W. L. Hunter, P. S. Lyon, W. S. Major, C. E. Miller, R. H. Porter, J. A. Quaid, Walter Samans, and H. C. Schweikart.

Committee on Entertainment: J. P. Clark, chairman, H. M. Wilson, vice-chairman, K. M. Busler, W. F. Cole, Hans Gartmann, T. W. Hopper, T. C. McMahon, and Jesse Taylor, Jr.

Annual Dinner Committee: S. T. Mackenzie, chairman, B. F. Keene, and John Taylor. Reception for Honored Guests Subcommittee: D. W. R. Morgan, chairman, R. C. Burton, C. B. Campbell, C. C. Franck, J. H. Harlow, F. W. Miller, W. M. Sheehan, and John Taylor. Ushers Subcommittee: G. J. Nicastro, chairman, C. H. Carman, B. H. Edelstein, E. J. Flavin, R. W. Flynn, H. A. Johnson, Tallman Ladd, J. M. Langley, E. W. Legier, and J. H. Prentiss. Old Guard: F. D. Herbert. asKme Girls: Mrs. Crosby Field.

Committee on Inspection Trips: B. W. Webb, chairman, C. H. Carman, Waldo Caven, B. H. Edelstein, D. G. Hubert, A. T. Hunter, A. L. Kisner, J. M. Langley, B. A. Lininger, E. J. Nicholson, J. H. Prentiss, and R. H. Stevens, Jr.

Committee on Student Aides: Co-chairmen; J. M. Langley (Metropolitan Section Jr. Group), Albert Schade, 3rd (Philadelphia Section Junior Group); Philadelphia Committee: E. Henry Bowes, M. P. Edge, W. E. McLaughlin, H. Donald Moll, W. H. Peirce, M. F. Pierpoline, Walter Schroth, Jr., and R. T. Vogdes, Jr.; Metropolitan Committee: J. A. Falcon, A. J. Hughes, R. L. Reich.

Committee on Women's Activities: Mrs. Eugene W. O'Brien, honorary chairman, Mrs. E. S. Bristol, chairman, Mrs. C. W. E. Clarke, vice-chairman, Mrs. G. S. Gethen, chairman registration, Mrs. H. I. Robinson, chairman hostesses, Mrs. W. M. Sheehan, chairman publicity, Mrs. Allen W. Thorson, chairman entertainment, Mrs. Benjamin W. Webb, chairman tea dance, and Mrs. E. F. Zeiner, chairman inspection trips.

PAST PRESIDENTS OF THE ASME IN ATTENDANCE AT THE 1947 ANNUAL MEETING

(*From left to right*: D. S. Kimball, W. H. McBryde, A. A. Potter, W. A. Hanley, R. V. Wright, Alex D. Bailey, H. V. Coes, H. N. Davis, D. R. Yarnall, A. G. Christie, E. W. O'Brien)

COMMENTS ON PAPERS

Including Letters From Readers on Miscellaneous Subjects

Distilling-Plant Economy

COMMENT BY CARL J. LAMB[1]

The author has presented an extremely interesting and constructive paper,[2] in which, however, he has undertaken to demonstrate the superiority of the steam evaporator plant over the electrically driven compression evaporator plant.

With respect to marine applications, there is undoubtedly a field for both types of plants. There are, of course, two different fields of marine applications for the steam evaporator plant which vary radically.

Merchant vessels normally are designed to operate during most of their lives at fixed speeds and loads. Until comparatively recently, merchant vessels took sufficient fresh water from the dock, both for reserve feed and potable purposes, to take care of all requirements for the voyage, and did not operate evaporators. The law required that certain types of merchant vessels carry emergency evaporators, which were generally single-effect high-pressure units. With the advent of high-pressure high-temperature steam, many modern merchant vessels were fitted with low-pressure double-effect evaporators to supply pure boiler make-up feed. In the case of such modern ships, few engineers will argue with the author that the most economic type of evaporator is probably the "reducing-valve" type, fitted with an additional source of supply of steam for port use. With respect to steam-propelled vessels, particularly combatant ships, where all make-up feedwater and potable water are always evaporated aboard the ship and where the vessel operates the majority of its life at a fraction of its load, the use of the reducing-type evaporator can hardly be justified. Complications are introduced by having to bleed the main propelling turbines at several different points, and additional weight and space are involved. Therefore the Navy-type evaporators employed on combatant ships and certain auxiliaries are generally low-pressure double-effect units obtaining steam from the auxiliary exhaust line which also supplies steam for heating the boiler feedwater.

There is, however, a justifiable application for a compression-type evaporator unit, because of the fact that, in addition to the main evaporator units normally installed, most large combatant vessels usually carry an emergency unit of such capacity as to take care of boiler make-up feed requirements and drinking water requirements in case of battle damage to one or more of the main evaporator units. Until the end of the recent war these emergency units were also steam-operated. From the viewpoint of a quick-starting emergency evaporator unit, which would be entirely independent of the ship's steam-supply lines and which could be so located as to be well protected and yet not require that bulkheads be pierced for steam-supply piping, the compression-type evaporator unit seems to be ideal and could be installed in practically any compartment on the ship. It could be arranged for either motor or internal-combustion-engine drive of the compressor, or for both types of drives.

The author evidently did not consider the case of the marine Diesel or gas-turbine-propelled vessel. A considerable proportion of the world's merchant tonnage, as well as a considerable percentage of naval auxiliary vessels and practically all submarines are propelled by Diesel engines. Here is the ideal marine field for the compression evaporator unit, especially since the evaporator feedwater may obtain additional heat units by utilizing part of the jacket cooling water. The gas turbine may soon be widely utilized both ashore and at sea. Here again, the compression evaporator unit is indicated as the ideal type to be used in merchant and naval vessels or land power plants where it is necessary or desirable to operate evaporators.

In recent developmental and experimental work with certain gas-turbine installations, there is reason to believe that water injection, not only to the gas-turbine compressor but to the gas turbine itself, may be desirable. It is evident, of course, that water to be used for such injections should be clean, free of solids and practically chemically pure, in order that no salts or scale will be deposited on the blades of either the gas turbine or its turbocompressor. Because such a water supply must be constant and its purity maintained at all times, it will be necessary to evaporate such water aboard ship and in most industrial power plants.

It is the belief of the writer's company, which acted as consulting engineers for the Cleaver-Brooks Company in the development of the vapor-compression evaporator unit which that company supplied to the amphibious forces, and of the writer who saw many such units in service, both as portable units to accompany the troops and as ships' evaporation units aboard internal-combustion-propelled amphibious craft, during the recent war, that there is a logical and well-determined application for the two types of steam evaporator units covered in the paper. There is also a well-defined and logical application for the electrically or engine-driven vapor-compression evaporator unit. Each should be applied to its proper field, and the determination of which unit to use will depend upon factors which can be determined readily by competent engineers. In addition, it is felt that there may be logical uses for the vapor-compression evaporator unit in certain branches of industry where evaporators are required for process or evaporation work, particularly in localities where good drinking water is not available for use in the processing of certain chemicals, foods, drugs, etc., due to hardness, undesirable salts, or alkalies.

The author based most of his figures with respect to the shipboard use of steam evaporators upon vaccua and resulting operating temperatures which are well below the sterilizing temperatures. While it is true that marine evaporators are designed to deliver water for boiler make-up feed which contains only $^1/_{10}$ grain per gal, and while it is also true that good evaporated water of such purity should not contain harmful bacteria, such almost chemically pure water has little or no taste, is not pleasant to drink, and does not contain the natural or normal salts which are beneficial to the human system.

During the war, it was the practice on four combatant ships, aboard which

[1] Staff Engineer, Douglas M. McBean, Inc., Consulting Engineers, Rochester, N. Y.

[2] "Distilling-Plant Economy," by A. M. Impagliazzo, MECHANICAL ENGINEERING, vol. 69, May, 1947, pp. 387–390.

the writer served as engineer officer, to operate the evaporators part of the day delivering water of 1/10 grain per gal purity for use as boiler make-up feedwater, and during the balance of the day delivering 5-grain water for ship's service requirements, such as cooking, drinking, bathing, laundry, etc. When delivering 5-grain water, it is necessary to operate the evaporators at temperatures above the sterilizing temperature in order that no harmful bacteria may be retained to affect the health of the crew. Such 5-grain-per-gal water tastes far better than water of 1/10 grain purity and is better for the human system.

In view of the method of operating evaporators aboard certain naval vessels during the war, and since the superiority of the 5-grain per gal water for human consumption is so marked, the author, in making his efficiency figures, should consider the fact that the normal naval evaporator installation in the future will probably operate 10 per cent of the time under extremely high vacuum, producing 1/10 grain per gal water, but during the remaining 90 per cent of the time it will be required to operate at a vacuum sufficiently low as to assure proper sterilization when producing 5-grain per gal water.

COMMENT BY ALLEN LATHAM, JR.[3]

Mr. Impagliazzo is to be congratulated for having presented a very interesting survey of the relative merits of steam-heated distilling units as compared with compression distilling units. His arguments are straightforward and the derivation of his conclusions is readily understood. However, I feel that some of his statements have an unwarranted tendency to belittle the future of compression distillation. For instance, he states that the best performance of compression units gives a fuel-economy ratio of 66. The derivation of this figure is evidently from values given for typical operation of a 1000-gallon per day unit in my paper on "Compression Distillation," which was published in the March, 1946, issue of MECHANICAL ENGINEERING. This is a very small plant in terms of industrial practice. Performance figures based on a plant of 25,000 to 100,000 gallons per day capacity would appear to be more significant. In a unit of such size, the allowance for heat losses by radiation per pound of distillate would be substantially less, which would make it practical to operate on a total energy input of about 39 Btu per pound of distillate. This results in a fuel-economy ratio of 119 for an electrically driven industrial unit instead of 66, as indicated by the author.

This situation is expressed in reverse in the author's conclusion number 1. Here he points out that if radiation losses were to be increased by 20 Btu per pound of distillate, the electrically driven compression unit would suffer a "22 per cent loss" in fuel-economy ratio. The radiation losses of the unit on which the figures in my paper were based are known to be large and there is no question but that this loss could be reduced substantially on large industrial units. Thus it would be far more accurate to conclude that by reducing the radiation loss 20 Btu per pound of distillate, the fuel-economy ratio would benefit by about 40 per cent, whereas no other form of evaporator would benefit as much as 10 per cent.

In conclusion number 3, the author indicates that the compression type of unit is more difficult to operate than a steam-heated unit. It is certainly true that a different set of variables must be controlled. However, wartime use proved that these variables are controllable with great ease. One factor which the author does not mention is that the compressor tends to stabilize the operation of the evaporator. A compression unit will give constant output of distillate much more readily than a steam-heated unit because the compressor automatically adjusts the steam pressure to compensate for the effect of scale formation and other factors which tend to vary the heat-transfer rate of the evaporator. Thus for one who is primarily interested in producing distillate at a constant and known rate, the compression unit is the easier to control.

Another aspect of the control problem is that the compression unit provides an independent self-contained operation. The operator is able to produce distilled water at good fuel ratio whenever he wishes, regardless of what conditions exist in the rest of the plant.

The use of inefficient small steam turbines to drive auxiliaries has often been advocated on the basis that an ample supply of exhaust steam was needed for operation of steam-heated evaporators. The author seems to imply that such steam should be charged to the evaporator at no cost because it would be wasted to the atmosphere if not used in the evaporator. I believe that in many situations it would be more economical to dispense with the use of small steam turbines entirely and use efficient electric-motor drive for all auxiliaries including an electrically driven compression-distillation plant.

COMMENT BY E. P. WORTHEN[4]

In the past most merchant ships have carried the necessary fresh water for make-up feed and personnel. In the last few years, however, development of the low-pressure distilling plant has reached the point where merchant shipowners now feel that it is feasible to make their own fresh water. Up to the present time, the writer's company has built and installed low-pressure distilling plants operating on the 8-psia bleeder on three classes of merchant vessels and has under way a fourth application. Table 1 of this comment gives the distillate-oil ratio for these ships.

TABLE 1 DISTILLATE-OIL RATIO OF DISTILLING PLANTS

Shaft horsepower of propelling machinery	5500		8000		9000		11000	
Steam conditions and main turbine:								
Initial pressure, psi	440		440		575		1425	
Initial temperature, deg F	740		740		840		740	
Vacuum, in. Hg	28 1/2		28 1/2		28 1/2		28 1/2	
Type of cycle	Nonreheat		Nonreheat		Nonreheat		Double steam reheat	
Distilling-plant capacity, gpd	5000		10000		30000		5000	
Distillate-plant type	Single effect		Single effect		Double effect		Single effect	
Extraction point, psia	9.8	37	6.5	40	8.4	43	5.5	44
Distillate-oil ratio	31	21	41	22	61	39	35	19
Oil consumption of evaporator in per cent of propelling-plant oil	1.5	2.4	1.6	2.8	3.0	4.7	0.9	1.5

A comparison of Table 1 with Fig. 6 of the paper indicates that the distillate-oil ratio obtained in service is considerably below the values indicated by the author.

It should be noted that Table 1 is based upon a condenser vacuum of 28 1/2 in. This is normal practice for shipboard installations since condensing equipment is usually designed for 28 1/2 in. of vacuum at 75 F injection temperature. This improvement in condenser vacuum results in a reduction of the distillate-oil ratio, since the gain due to bleeding at a given pressure is less with a lower turbine-exhaust pressure.

In addition to the foregoing, it is believed that the steam required for air ejectors, pumps, etc., on shipboard is

[3] Arthur D. Little, Inc., Cambridge, Mass. Mem. A.S.M.E.

[4] Bethlehem Steel Company, Shipbuilding Division, Quincy, Mass.

considerably in excess of the allowances made for these services by the author.

Despite these relatively poorer distillate-oil ratios obtained on recent shipboard installations, it is interesting to note that the percentage of oil required to supply the necessary fresh water is only about 1½ per cent of the total fuel consumed for cargo vessels, and about 3 or 4 per cent for passenger vessels with large distilling plants.

Possibly the most important point which has been brought out by this paper is that, by integrating properly a low-pressure distilling plant into the power cycle, a large improvement can be made in its over-all economy.

COMMENT BY THEODORE BAUMEISTER[5]

The alternate choice of (1) the conventional steam-heated evaporator, or (2) the compression-distillation evaporator for use in a steam power plant is a fascinating problem. As the author points out, the compression evaporator is not as novel as many engineers seem to think. The heat pump, or thermocompressor, for the purification of liquids has been proposed on many occasions. It has found considerable favor in many applications. It became stylish during the war for military uses, where its portability, flexibility, and compactness were all of compelling importance. It, like topping practice in steam-power plants in the 1930's, is now being studied with great care by many reputable engineers and organizations. It contains the germ of a potent idea. It can conserve natural resources to an important extent. The cost, however, is often a real stumbling block. This is particularly true in the steam-power plant where there is an excess of exhaust or extracted steam which can be conveniently and directly used for make-up evaporation. The economic aspects of the problem must contain the ultimate answer unless the intangibles are so significant as to offset any added cost by the use of the thermocompressor. The economic picture is well presented by the author in his analysis. While the several examples cited may not indicate a preference for the heat pump, it should be recognized that generalizations, as always, may be fraught with danger. The ultimate answer is to be found only in the local circumstances surrounding a specific case.

The continuing rise in the prices of fuels offers a real inducement to the development of power and heat-saving equipment. It is, consequently, entirely reasonable to find cases which can justify high investment on present-day fuel prices and which were precluded, not many years ago, by lower fuel prices.

Recent years have witnessed a tremendous development in the field of centrifugal and axial-flow compressors, with greatly improved reliability and efficiency, and without equivalent increases in investment cost. This is peculiarly favorable to the thermocompressor for use in the preparation of steam-power-plant make-up. The large volumes of vapor can be readily handled in the high-speed machines, using any form of high-speed drive. The designer is accorded wide latitude of choice in the evaporator plant as it is no longer dependent upon proximity to a particular extraction steam line and juxtaposition to specific feedwater heaters or condensers. The plant operator is also given latitude in his production schedule because the compressor-evaporator capacity, at sustained efficiency, is not rigidly tied to the steam-turbine load. The thermocompressor can typically be run to deliver maximum make-up when the plant load is a minimum. This is an advantage of considerable financial worth because of the common operating procedure of attempting to accumulate make-up during light-load periods. In fact, this reasoning could be extended to the limit by shutting down all make-up equipment when plant peak loads are encountered and, in turn, operating the compression-distillation equipment only during off-peak periods. If the compressor were motor-driven, as would be likely, the unit could be operated from the interconnected system whenever desired. This, and similar features when properly considered and evaluated, should do much to foster the further development of compression-type distillation plant.

AUTHOR'S CLOSURE

The author wishes to thank Messrs. Lamb, Latham, Worthen, and Professor Baumeister for their interesting and informative comments. Their discussions have increased the value of the paper. Mr. Lamb's remarks have also broadened its scope.

Originally the paper was limited to "a presentation of fuel-economy ratios, and to a discussion of some of the other factors affecting the over-all economy." The author did not undertake to demonstrate the superiority of one type of plant over another as suggested by Mr. Lamb, but his analysis did indicate that when the required source of heating steam is available, distilled water can be produced at less expense by "reducing valve" and by some types of low-pressure steam distilling plants than by any of the compression types. It was clearly pointed out that in many instances criteria other than over-all economy would dictate the choice of plant. Mr. Lamb, himself, does not attempt to justify the installation of a compression-type unit on a steam-powered vessel on economic grounds. Whether it can be justified on other grounds depends entirely upon the relative importance attached to other factors, some favoring the compression type, others the steam plant. The author did not attempt to discuss these factors in the paper, and it is impossible to do so adequately here. The chief advantage of the compression-type plant is its independence of the ship's steam supply lines but this would appear to be of little value on large combat vessels where it is not difficult to find two well-protected compartments already supplied with steam piping.

In his comments regarding Diesel and gas-turbine applications, Mr. Lamb appears to have overlooked the author's conclusion that vapor compression should prove economical in cases where distillation must be accomplished independently of a steam-power plant, or other steam installation.

The author cannot agree with Mr. Lamb's thesis that distilling plants should be operated at higher temperatures in order to produce sterile 5-grain per gallon water for ships' service requirements. It has been definitely established by extensive tests that potable distillate is produced at very low temperatures from the most highly contaminated feedwater provided there is no carry-over of unevaporated brine. The salinity of the product therefore is also an index of its potability when operating with feedwater of high salt content. The U. S. Public Health Service has ruled that a salinity of .25 grain per gallon must not be exceeded. This is far more effective in insuring potability than any attempt to obtain sterility by operating at reduced vacuum, since the latter method does not guard against the possibility of contamination by leakage in the distiller condenser or condensate cooler.

The argument regarding the relative palatability of 5-grain water versus .1. grain water is too old to be settled by the conflicting views of two observers. In the absence of an authoritative poll of opinion, the author can only state that he, personally, cannot distinguish between the two without the aid of a salinity indicator and that he has found most people share this inability although some agree with Mr. Lamb and others stoutly maintain that 5-grain water is

[5] Professor of Mechanical Engineering, Columbia University; Consulting Engineer, American Gas and Electric Service Corporation. Mem. ASME.

actually salty. As a matter of fact, it is extremely doubtful that 5-grain water was actually produced consistently on any combat vessel equipped with one of the 3500 or more modern low-pressure distilling plants with whose design and performance the author is intimately familiar. The total capacity of these plants exceeds 35,000,000 gallons per day, and practically every American steam-powered combat vessel used in World War II was supplied with one or more of them. It is characteristic of the design of these units that there is no operating variable which can be regulated to maintain a salinity of 5 grains per gallon with any consistency. The salinity remains less than .25 grain per gallon for a wide range of water levels, brine densities, and capacities but when the extreme limits for these variables are exceeded, it jumps rapidly and becomes completely uncontrollable. There were a very few instances where, contrary to both the Navy's and manufacturer's instructions, the upper limit of acceptable salinity was increased to something greater than .25 grain per gallon when distilling to ships' service tanks. When the limit was so increased to 1 grain, it was the common practice to call the product 1-grain water. Actually, however, raising the upper acceptable limit did not increase the salinity. It merely relieved the operator of the necessity of diverting the output to the bilge when due to momentary instability the salt content exceeded .25 grain but remained less than 1 grain. The plant continued to produce 1-grain water most of the time and the actual average salinity of this 1-grain water generally was less than .25 grain per gallon. Unless it was determined by tests that the salinity in the potable water tanks was actually 5 grains, it is probable that the 5-grain water which was found so palatable also averaged less than .25 grain.

The author cannot confirm or refute Mr. Lamb's views regarding the beneficial effects of 5-grain water on the human system but feels that it would be extravagant indeed to increase operating temperatures thereby multiplying scale formation and descaling costs for the sole purpose of adding a few tablespoons of salts per day to the diet of the entire ship's company. Only a very small fraction of ships' service water is used for drinking purposes, practically all of it being used for washing and bathing.

Since one tablespoon (about 450 grains) of sea salt per hundred men would supply as much of these salts as 5-grain drinking water, it should prove far more economical to provide this small quantity of additional salts through the medium of the ship's cook, if it is really necessary.

The author agrees with Professor Baumeister that the increasing cost of fuels provides a real inducement to the development of power- and heat-saving machinery, but does not feel that this factor will always prove favorable to the compression-type plant. In the case of steam-power plants, an increase in fuel costs should favor the steam evaporator since, when it is properly integrated with the power plant, its fuel ratio is greater than that of a compression-type plant of the same capacity and same initial cost.

It is unquestionably true that advances in the field of compressor design and performance should aid the development of the compression-type evaporator. It is also true that where flexibility in evaporator capacity with respect to turbine load is desirable, the thermocompressor has an inherent advantage. Whether this advantage is sufficient to overcome the greater economy of the steam evaporator in these cases can be determined only by an individual study giving proper weight to each factor. Some flexibility in the capacity of steam evaporators can be provided of course by supplying alternate sources of heating steam.

Mr. Latham feels that some statements in the paper have a tendency to belittle the future of the compression-type plant. This was not the author's intention. On the contrary, it was hoped that the analysis presented would contribute to the development of this type of plant by helping to define the area in which its installation can be justified economically under present conditions. It is quite probable that some improvement in the fuel ratios of the compression-type plants can be achieved in larger units, but it appears to be entirely unlikely that a reduction in energy input per pound of distillate of 31 Btu can be attained by an increase in size alone. Any improvement of this proportion must rely also on a reduction in venting losses, and a reduction or total elimination of blowdown which may not always be practical.

The author agrees that his conclusion number 1 is equally accurate when applied in reverse. The main point of this conclusion was simply that the fuel ratio for the compression-type plant is subject to wide changes due to operating variables while that for the steam plant is not. Heat losses are more likely to be increased than decreased in operation. Increased blowdown, decreases in feed temperature, scale formation on the feed-heating surface, and increases in venting losses have no significant effect on the fuel ratio of the low-pressure steam plant but any one of them alone can cause a large reduction in that of the compression-type plant.

It is true that a compression-type unit employing a positive-displacement-type compressor tends to give fairly constant capacity by automatically adjusting steam pressure to compensate for the effects of scale on the evaporator heating surfaces. However, it is also a fact that a constant capacity has been maintained for even longer periods by the use of orifice control in some steam plants, and in others operating at higher vacuum, by the practical elimination of scale formation.

The author certainly agrees that when an inefficient steam turbine is used to drive auxiliaries in order to provide exhaust steam for evaporators, a charge for the loss of turbine efficiency must be made against the evaporator. The practice is justified, nevertheless, if the combination results in greater over-all economy than alternate methods. In any event, Mr. Latham's inference seems to be unwarranted since the statement to which he appears to refer stated the simple fact that "if the heat of the auxiliary exhaust would otherwise be wasted, no additional fuel is required to operate the plant, and its fuel ratio is infinite." It referred to a single-effect steam plant heated by auxiliary exhaust, and was used to illustrate the inadequacy of the widespread practice of expressing the "performance" of compression-type plants in terms of a so-called equivalent number of effects of a conventional-type plant. It was pointed out that under the assumed conditions, following this practice would lead to the confusing conclusion that this conventional single-effect plant resulted in a "performance" comparable to an infinite number of effects of a conventional plant.

The information presented by Mr. Worthen in Table 2 of his discussion is a most valuable contribution. The author's Fig. 6 was based on low-pressure plants arranged as illustrated in Figs. 2 and 3 of his paper. These low-pressure plants were not necessarily intended to represent present marine equipment although blowdown was assumed at a rate sufficiently high to cover such installations. The plants illustrated differed from the actual shipboard installations discussed by Mr. Worthen in some important respects besides the difference in ship's main condenser vacuum to which he calls attention. Among these differences, those affecting the fuel ratios are the source of air-ejector steam, the point to which air-ejector condenser and tube-nest drains are discharged, and the inclusion of an inner heater in the dis-

tiller condenser shown in Fig. 2 which is usually omitted in single-effect marine applications. In another paper[6] not yet published, calculated fuel ratios are presented for typical marine plants and these agree closely with those reported by Mr. Worthen.

The discussions have emphasized the fact that in specific cases certain features of one or another type of plant have a value which may justify greater costs. The value of such features, however, depends entirely upon conditions peculiar to a given application. For example, the weight of a plant makes little difference in a central power plant, but is a factor of considerable economic importance on board a ship. The author deliberately avoided an analysis of these factors in the interests of brevity but hopes to discuss at least some of them in detail in future articles.

A. M. IMPAGLIAZZO.[7]

[6] "Low-Pressure Steam-Heated Marine Distilling Plants," by R. M. Bent and A. M. Impagliazzo, presented at the Annual Meeting, Atlantic City, N. J., Dec. 1-5, 1947, of The American Society of Mechanical Engineers.

[7] Engineer, Griscom-Russell Company, New York, N. Y. Mem. ASME.

Civil-Service Employment

TO THE EDITOR:

I wonder if an absent-minded professor with a long memory may comment on Mr. Royal Weller's letter[8] which appeared in a recent issue? It is observed that Mr. Weller is a civil-service employee in the Naval Ordnance Laboratory, Washington, D. C. His appeal is addressed to college professors and placement directors. The theme of his letter refers to positions of college grade. It is obvious that Mr. Weller is happy in the position he holds, is reasonably satisfied with his working environment, and is interested enough in the management problems of the laboratory to concern himself as to the quality and quantity of its personnel.

Mr. Weller raises the question as to the advice a faculty adviser should give a young graduate physicist in choosing a career. Should we advise the young man to go to the Bell Laboratories, to the Naval Research Laboratory, or to the University of Chicago? He assumes that the faculty adviser is not too well acquainted with the opportunities afforded in civil-service employment. In this he provides a list of twenty-three factors which he thinks should influence a graduate in his choice. We have no quarrel with that list. Practically all of the authors of texts on personnel management will agree with Mr. Weller. However, he did miss one important factor, and which most of the authors discuss, that is, the "social status afforded by the job." And this is a very important factor in the consideration of a civil-service job in any one of the three military divisions of our Department of National Defense.

Including "social status" brings the list of factors to twenty-four. The writer has served as a civilian personnel officer in the Army and has had to coordinate his activities with the Air Force and Navy. With that experience I wonder why Mr. Weller overlooked factor No. 24. Perhaps social status does not have the importance in Washington that it does in an outlying station like Guam, Okinawa, Tokyo, or in Europe, and where the civil-service employee must depend on the Army or Navy (whichever employs him) for his housing, messing, and recreation. Mr. Weller probably works his 8 hours a day and he does not see a uniform until he arrives on the job the next morning. His social life is what he chooses to make it.

There are military directives in effect which state that a civil-service employee in CAF-7 and equivalent grades in the P- and UN-classifications are automatically entitled to officer privileges and accomodations. However, local commanders disregard these directives in many instances and bar civil-service employees from officers' clubs and other recreational facilities. They will do little or nothing to provide adequate housing. At the same time, they will ride the civilian personnel officer because of the volume of resignations, his inability to procure new recruits, and call him up on the carpet for being too soft with the civilians. The Bell Laboratories, or Chicago University, or, in fact, any other employer outside the Army, Navy, or Air Force will never get too tough in a tight labor market or situation. Furthermore, they have enough sense not to create one.

I have had excellent opportunities to observe the effects of a reduction in forces in industry, the military establishments, and in civil service. The depression of the 1930's deeply affected many industrial establishments and, in some instances, these effects have not yet completely disappeared. World War II caused a violent expansion in civil service. Men and women who were CAF-2 and CAF-3 clerks before the war were "blown up" during the war to CAF-9, CAF-10, and on up, simply because of their knowledge and familiarity with civil-service rules, regulations, and procedures. Professionally they are just as ignorant now as they were before the war. However, these people now are in control of civil-service appointments and force reductions. They have gone all-out to take care of themselves. The reader is referred to a fine article on this subject[9] by Congressman Christian A. Herter from Massachusetts. No faculty adviser is going to go "all-out" for civil-service employment after reading that article—at least if he gives serious consideration to Mr. Weller's twenty-three factors.

During my intimate contact with civil-service employment, I saw the "grades" awarded to a man who offered nearly thirty year's experience in examinations for which he filed applications. There were two. On one he received 72 which included the ten allowed because he was a veteran. He was unqualified for the other. He should have both letters framed and hung in his office. The comments and wisecracks would not be very complimentary to civil-service employment. This man is well known in industry for his accomplishments in labor relations. He was primarily curious as to how he might stand with respect to civil service, rather than in taking a civil-service position. The reader can draw his own conclusions.

Another instance was the case of a member of an inspection team who had been a low-graded clerk in the War Department prior to World War II, blown up to a WAC major during the war, and is now a CAF-8 or 9 in the personnel office of an overseas headquarters. She got into a hot argument with the employee-relations director of a subordinate headquarters which she was inspecting with others of the team. The employee-relations director is a postgraduate in personnel relations at Columbia University, and undoubtedly knows more about the subject than the ex-Wac major would ever know if she studied for a lifetime. However, the ex-WAC major did not consider the controversy on its merits. In fact, she did not have the background or experience to enable her to do so. She preferred charges, cried on the shoulder of the local headquarters' chief of staff, who was susceptible, with the result that a competent and courageous employee-rela-

[8] "Civil Service Employment," MECHANICAL ENGINEERING, vol. 69, Oct., 1947, p. 865.

[9] "Our Most Dangerous Lobby," *Reader's Digest*, September, 1947.

tions director submitted her resignation to avoid having to defend herself against charges and all the rest of the headaches that go along with such defense. The ex-employ-relations lady now has a responsible job in industrial personnel work and is quite happy about the whole thing.

The trouble with civil-service employment, where any one of the three military services constitutes the "management," especially right now, is that the management is military-personnel-minded and not civilian-personnel-minded. Regardless of reports to the contrary notwithstanding, the military caste system is still very much in effect. The military mind is trained to handle soldiers who are trained to win battles, with all the waste, arbitrary command, and so on, that the job of winning a battle entails. The military mind gets into a state of confusion when it has the job of managing employees whose primary task is work production, conservation of materials, who work eight hours a day, get time and one half for overtime and can quit when they do not like you. During the several assignments I served as a civilian personnel officer, I was confronted with violations of practically every basic and accepted principle of personnel management taught in any textbook, and which could never happen in an industrial concern. Right now I would advise a student that civil-service employment, especially with any one of the three military services, is something to stay away from, very far away, unless he is very hungry.

The after-effects of a catastrophe such as World War II cannot help but be painful. In this we would be unreasonable to expect civil service to be an exception. Reductions in our military forces and more or less tight strings on the military budget have created many personnel problems. Most of these appear to be known and recognized by the Congress and by our general staffs in Washington. In time something will be done about it. However, right now—at least—the peacetime Army is being "managed" by the Regular component, who are fighting among themselves trying to retain their wartime grades, and a lot of Reserve and National Guard officers still on duty, spending most of their time and effort trying to stay out of trouble. Such a situation within the management group cannot be conducive to efficiency. Nor, under such circumstances, can the young physicist Mr. Weller is concerned about be assured that he will enjoy the twenty-three (or twenty-four) factors listed in Mr. Weller's excellent letter.

After all, and as Congressman Herter has so ably pointed out, we do need and need badly the best men and women we can get for civil-service employment. Therefore it becomes another one of the many tasks of citizenship during these difficult times to see that the basic principles of modern management are applied to civil-service employment—not merely written into civil-service personnel regulations by the experts in Washington but actually applied on the job. Thus the reason and inspiration for this letter.

MARION B. RICHARDSON.[10]

[10] Assistant Professor, Personnel Management and Industrial Relations, Iowa State College, Ames, Iowa. Mem. ASME.

REVIEWS OF BOOKS

And Notes on Books Received in the Engineering Societies Library

Scientific Blacksmith

SCIENTIFIC BLACKSMITH—An Autobiography, by Mortimer E. Cooley with the assistance of Vivien B. Keatley. Published by the Alumni Association of the University of Michigan, Ann Arbor, Mich. Cloth, 6 × 9 in., 290 pages, $3.50.

REVIEWED BY DEXTER S. KIMBALL[1]

THIS is the story of a boy who was born in the country but wanted to "go down to the sea in ships." Born on a farm near Canandaigua, N. Y., in 1855, he was graduated from the Naval Academy in 1878 in a class of fourteen. He served on shipboard and in the Bureau of Steam Engineering at Washington until 1880 when he was assigned to the University of Michigan. He served as professor and Dean of the College of Engineering and Dean Emeritus until his death in 1944. He was therefore one of that remarkable group of men who retired from the Navy during the latter part of the last century and engaged in teaching. This group included Thurston of Stevens and Cornell, Cooley, his classmate and lifelong friend, Hollis of Harvard and Worcester Polytechnic Institute, Spangler of Pennsylvania, and Durand of Cornell and Stanford. These men had a profound influence upon engineering education in this country. Thurston, Cooley, Hollis, and Durand all became presidents of The American Society of Mechanical Engineers. Thurston was the first president of the Society. His contribution to science and education was great and lasting. Durand still survives at Stanford, loved and admired by all who know him.

No biography or autobiography could quite describe Dean Cooley. One had to know him personally to fully appreciate this colorful, positive, and altogether lovable man. His zest for life is well reflected in the many anecdotes he tells and the salty character of his writings. He remained a sailor to the end of his days.

The first part of the book tells of his boyhood and school life in the country school and at the Canandaigua Academy. Curiously enough he taught in one of the district schools while only seventeen years of age and a chapter is devoted to his four years at the Naval Academy. He was married shortly after graduation and he writes very feelingly of his wife. His married life was obviously a very happy one.

Chapters 5, 6, and 7 are devoted to his teaching days at the University of Michigan. These are of peculiar interest, for Cooley lived for 63 years continuously at Michigan and saw the College of Engineering grow from crude beginnings to the great institution that it is today. Few men have had such an experience. The title of his biography "Scientific Blacksmith" was bestowed upon him by Dr. Adams who taught latin and history, and referred to the first laboratory building that Cooley built which was 24 feet wide and 36 feet long, in which he actually taught blacksmithing. It is an interesting story of a very

[1] Past-President and Honorary Member, ASME.

successful teacher and college administrator.

In chapters 8 and 9, Cooley tells some of his experiences as a consulting engineer and as an appraiser of public utilities. In this latter field he became quite an authority. These chapters, however, do not do justice to his many activities in practical life. The sketch of his life in "Who's Who in America" indicates a wide range of practical work. Cooley never lived a sequestered academic life.

During the Spanish war of 1898 Cooley obtained leave of absence from the University and enlisted in the Navy. He saw actual war service around Cuba, an experience which he relates with evident relish. The remaining chapters with the exception of the last are concerned with personal reminiscences, his many activities in professional societies, and a jocular account of his unsuccessful campaign for the U. S. Senate as a democrat in a territory where democrats were few and far between. He includes a full-page picture of himself and his lifelong friend, Ira N. Hollis, which brings back a wave of memories to this reviewer.

In 1888, Hollis was assigned by the Navy to inspect the construction of the engines of the cruiser *Charleston*, under construction at the Union Iron Works at San Francisco. This vessel, one of the very first of modern warships owned by the United States, was of only 3500 tons and the designs for the vessel had been bought in England. Hollis was only 32 years of age. I was working in the machine shop and became quite well acquainted with him, an acquaintance that was renewed ten years after when I came to Cornell. For many years I enjoyed the friendship of these two very interesting men.

In the last chapter, "The Engineer and the Future," Dean Cooley rounds up his long experience as an engineer and teacher with an appeal for broader and higher training for engineers, a subject long dear to his heart. He advocates broader training for the undergraduate years and graduate schools of engineering for those capable of such training. The chapter is well worth reading.

The book is easy reading and has many interesting illustrative stories. There is considerable mild profanity and many references to liquor which might give a wrong impression to a stranger, for Cooley was a man of dignity and moral uprightness. Faults he had, like all of us, but, as Samuel Johnson said of Oliver Goldsmith, "Let not his frailities be remembered; he was a very great man."

American Miracle

AMERICAN MIRACLE. By Van Rensselaer Sill. The Story of War Construction Around the World. The Odyssey Press, Inc., New York, N. Y., 1947. Cloth, $6^1/_8 \times 9^1/_4$ in., 301 pp., 18 charts, 64 full-page illus., $4.

REVIEWED BY WILLIAM F. RYAN[2]

THE "American Miracle" described by this book was the expenditure of $49,000,000,000 by the Corps of Engineers, the Seabees, and the great fraternity of American construction contractors throughout the world, during the five war years. The more one knows about engineering and construction, the more miraculous this achievement seems and it is not surprising that the author, staggered by the story he is unfolding, sometimes becomes mildly inarticulate.

Unquestionably, the bulldozer is the hero of this book. Mr. Sill pays due tribute to the towering structures designed for the production of high-octane gasoline and synthetic rubber, the magnificent works in concrete and masonry erected on all the continents of the world and on the shores of every sea, and the amazing complexity of the plants which "hatched two eggs" for the destruction of Hiroshima and Nagasaki, but every project begins with the bulldozer, and its earth-moving miracle.

"Meet the Bulldozer" is the title of the first chapter, and from then on we encounter this mighty cog in the war machine on every job, in every clime, even dropping from the sky by parachutes into the midst of the jungle. The greatest airfield in the world is neither La Guardia nor Idlewild, but an airfield on the Island of Tinian where mountains were leveled and swamps were filled to provide a deck from which the Japanese could be bombed into submission. Mr. Sill tries, by every device imaginable, to make comprehensible to the reader the millions and millions of yards of earth moved by the American constructors during the war but, in the end, it is still a miracle.

The book outlines briskly the full cycle of construction projects. Wisely, the author has refrained from naming any of the individual contractors or engineers whose achievements he records. The Army alone employed more than 5300 contracting firms and 300 architect-engineers, and it would be obviously impossible, in 300 pages, to give each of them his due meed of praise. It is the collective accomplishment which constitutes the miracle.

The value of the book as a reference work is enhanced by the official reports by the chiefs of the eleven government agencies under whose direction this miracle was wrought and by the voluminous statistics covering the dollar volume of each class of work, month by month and year by year, for the entire period. The crowning feature of the book, however, is the collection of amazingly expressive photographs, and the overpowering statistics are made at least partially comprehensible by the excellent drawings produced by Howard E. Chapman. While no amount of illustration or description can rationalize the miracle performed by the American construction industry in World War II, Mr. Sill's book is a valuable record of the scope and magnitude of this achievement.

[2] Assistant Engineering Manager, Stone and Webster Engineering Corporation, Boston, Mass. Fellow ASME.

Books Received in Library

BUSINESS PLANNING AND CONTROL. By F. H. Rowland. Harper & Brothers, New York, N. Y., 1947. Cloth, $5^1/_2 \times 8^1/_2$ in., 337 pp., diagrams, charts, tables, $4. Using as a background his experience as a consultant to many corporations, the author considers the problems which face top management today, and analyzes the essentials of modern business organization and control. The first half of the volume outlines the factors in product selection, market forecasting, sales methods, and production plans. Specific techniques of budgetary control, organization procedures, and personnel policy are considered in the second half.

CHEMICAL PROCESS PRINCIPLES, Part 2. Thermodynamics. By O. A. Hougen and K. M. Watson. John Wiley & Sons, Inc., New York, N. Y.; Chapman and Hall, London, England, 1947. Cloth, $5^1/_2 \times 8^3/_4$ in., pp. 437–804 and Appendix and Index, pp. XVII-XLVIII; diagrams, charts, tables, $5. The second part of "Chemical Process Principles" is devoted to the fundamental principles of thermodynamics. Particular attention is paid to generalized methods. The application of these principles to problems in the compression and expansion of fluids, power generation, and refrigeration are discussed. The mechanical or equipment problems of such operations are not treated. Mention is made of the thermodynamics of solutions, with emphasis placed on generalized methods for dealing with deviations from ideal behavior. Applications are made in the calculation of equilibrium compositions in both physical and chemical processes. One chapter deals with the new methods of estimating thermodynamic properties by statistical calculations.

CONTROL CHARTS, an Introduction to Statistical Quality Control. By E. S. Smith.

McGraw-Hill Book Co., Inc., New York, N. Y., and London, England, 1947. Cloth, 6 × 9¼ in., 161 pp., diagrams, charts, tables, $3. Providing a simple, nonmathematical introduction to the methods and charts of statistical quality control, this volume presents the material with emphasis on practical applications. The first chapter stresses the importance of statistical methods. Chapter 2 deals with frequency curves and their use in analyzing statistical data. The charts are to be found in chapters 3 and 4, while chapter 5 is devoted to formulas used in previous discussions. Features of this book are a new method of determining satisfactory location of control limits with respect to specification limits and a labor-saving table for computing control limits for a chart of fraction derivatives.

ELEMENTARY NUCLEAR THEORY. By H. A. Bethe. John Wiley & Sons, Inc., New York, N. Y.; Chapman & Hall, London, England, 1947. Cloth, 5½ × 8¾ in., 147 pp., diagrams, charts, tables, $2.50. Since the volume contains only selected topics in the theory of atomic nuclei, it is not intended as a text for the entire theory but rather an introduction for students and scientists who are not specialists in the study of nuclear physics. Emphasis is placed on the problem of nuclear forces, and the treatment is entirely from the empirical point of view. The available evidence on nuclear forces is presented from the behavior of the simplest nuclear systems. Purely theoretical considerations, such as the meson theory, are treated briefly. The theories of beta disintegration and the compound nucleus are discussed. The theory of the fission process and the theory of nuclear systems are omitted as special phenomena. An appendix contains a table of nuclear species giving the isotopes of the elements, their abundance, and products of disintegration.

HANDBOOK OF PERSONNEL MANAGEMENT. By G. D. Halsey. Harper & Brothers, New York, N. Y., and London, England, 1947. Cloth, 6 × 9½ in., 402 pp., diagrams, charts, tables, $6. A discussion of the basic principles and theories of personnel management is presented to enable the reader to evaluate the methods used. This book is devoted to the practical aspects—what the problems and objectives of personnel management are, and how these problems have been solved and these objectives accomplished in many organizations. In this college-level text, such problems as job analysis, induction of new employees, correction and discipline, wage incentives, profit-sharing plans, and labor relations are presented. References are given at the end of each chapter, and an appendix lists sources of information and help in personnel management.

Library Services

ENGINEERING Societies Library books may be borrowed by mail by ASME members for a small handling charge. The Library also prepares bibliographies, maintains search and photostat services, and can provide microfilm copies of any item in its collection. Address inquiries to Ralph H. Phelps, Director, Engineering Societies Library, 29 West 39th St., New York 18, N. Y.

ASME BOILER CODE

Interpretations

THE Boiler Code Committee meets monthly for the purpose of considering communications relative to the Boiler Code. Anyone desiring information on the application of the Code may communicate with the Committee Secretary, A.S.M.E., 29 West 39th St., New York 18, N. Y.

The procedure of the Committee in handling the cases is as follows: All inquiries must be in written form before they are accepted for consideration. Copies are then sent by the Secretary of the Committee to all members of the Committee. The interpretation, in the form of a reply, is then prepared by the Committee and is passed upon at a regular meeting.

This interpretation is later submitted to the Council of The American Society of Mechanical Engineers for approval after which it is issued to the inquirer and published in MECHANICAL ENGINEERING.

Following is a record of the interpretations of this Committee formulated at the meeting of October 17, 1947, and approved by the Council on November 17, 1947.

ANNULLED CASES

Case Number	Paragraph Revised
961	P-102 (b)
1029	A-18 (a)
1031	P-286, P-289
1035	Figs. P-2, L-9, U-15
1039	P-332 (e)

CASE No. 897

(Reopened)

In Item (3) *b*, change last sentence to read: "Cool in still air or in the furnace."

Item (6) add the following sentence:

"The allowable working stresses for Grade Mc shall be the same as those given for Grade M in Table U-2 for temperatures up to and including 1000 F."

CASE No. 1036

(*Annulled*)

CASE No. 1056

(*Special Ruling*)

Inquiry: May Par. U-69 vessels with maximum thickness less than 0.58 in. be fabricated from flange quality steel meeting the following chemical and physical requirements:

Carbon, max, per cent.....	0.33
Manganese, per cent.....	0.85–1.15
Phosphorus, max, per cent.	0.04
Sulphur, max, per cent....	0.05
Silicon, max, per cent.....	0.10

	Grade A	Grade B
	3/16 to 3/8 in.	Over 3/8 to 5/8 in.
Tensile strength, psi.....	75,000–90,000	73,000–88,000
Yield point, min, psi.....	37,500	36,500
Elongation in 8 in., min, per cent..	1,600,000 tens. str.	1,600,000 tens. str.
Elongation in 2 in., min, per cent..	24.0	24.0

In all other respects the material shall comply with Specification SA-225 Grade B. The maximum allowable design stress for metal temperatures not exceeding 650 F shall be 15,000 psi for Grade A, and 14,600 psi for Grade B.

Reply: It is the opinion of the Committee that this material may be used within the limitations given in the inquiry in the fabrication of Par. U-69 vessels, except that stress-relieving is not required.

CASE No. 1060

(*Interpretation of Specification SA-83*)

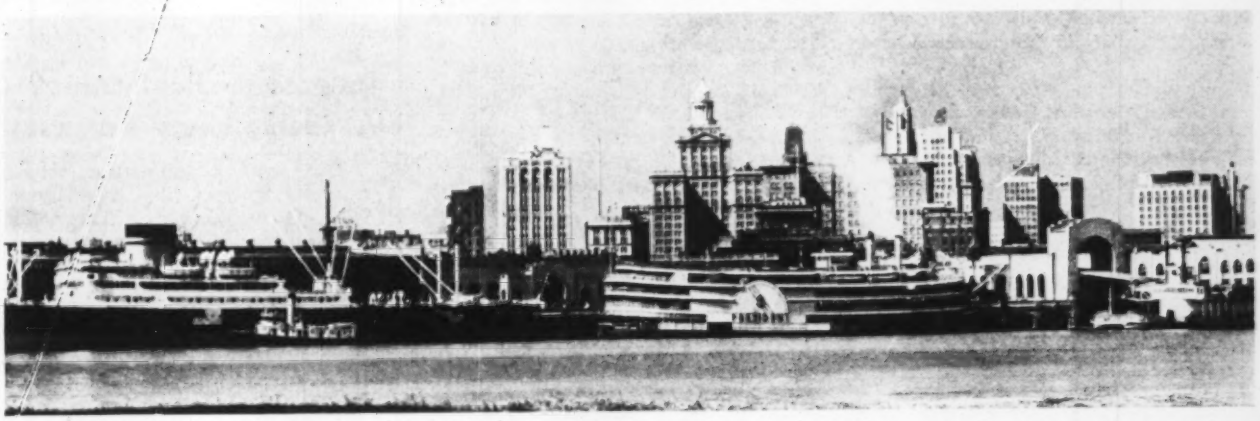
Inquiry: Will tubes less than 2 in. in outside diameter complying with A.S.T.M. Specifications A 179-46 meet the intent of Section I of the Code?

Reply: As such tubes are acceptable for unfired pressure vessels as covered by the note in the heading of Specification SA-83, it is the opinion of the Committee that tubes less than 2 in. in outside diameter of material complying with Specification A 179-46, ordered to minimum wall thickness, will meet the intent of Section I of the Code.

ASME NEWS

And Notes on Other Engineering Societies

COMPILED AND EDITED BY A. F. BOCHENEK



NEW ORLEANS, LA., AS SEEN FROM THE MISSISSIPPI RIVER

ASME 1948 Spring Meeting to Be Held in New Orleans, La., March 1–4

IN recognition of the growing industrial importance of the South, The American Society of Mechanical Engineers has accepted for the third consecutive year, an invitation to hold its Spring Meeting in a southern region of the Society. The 1948 Spring Meeting will be held at the St. Charles Hotel, New Orleans, La., March 1–4, 1948, with the ASME New Orleans Section as host.

Aside from its commercial importance as the southern gateway to the United States and as a financial, industrial, and distribution center of the South, New Orleans is an ideal city for a Society meeting because it offers so much of cultural and historical interest. Here the charm of the Old World is everywhere evident in the quaint architecture and local customs. Its monuments revive colorful legends and romances. Its mild spring weather and the hospitality of its people attract annually visitors from all over the world.

An interesting program of technical sessions, luncheons, dinners, and plant-inspection trips is being planned. The following Divisions are to hold technical sessions: Fuels, gas turbine power, heat transfer, management, materials handling, metals engineering, power, and process industries.

Some of the subjects to be covered are: Utilization of bagasse as fuel, the gas turbine as a stationary prime mover, cooling towers, engineering the tin can, and others.

The social program will begin with a reception at the International House on Monday evening, March 1, at which the showing of color films of former Carnival Balls will be featured. On Tuesday an informal ball will be given in the Tulane Room of the Jung Hotel. The banquet will be held on Wednesday at the St. Charles Hotel.

Interesting Trips Planned

A guided tour through the new semioutdoor generating station of the New Orleans Public Service, Inc., located on the Industrial Canal, connecting the Mississippi River with Lake Pontchartrain just east of metropolitan New Orleans, will be a feature of the meeting. Through the courtesy of the Board of Commissioners of the Port of New Orleans, arrangements have been made to provide water transportation of 85 members aboard their yacht "Good Neighbor." So that a maximum number will be able to avail themselves of this trip, which will be from the foot of Canal Street down the Mississippi River to the Industrial Canal, through the locks at the river end of the canal to the dock of the Industrial Canal Station, two groups of 85 tickets will be prepared, one group for the outbound trip and the other for the return trip. In this way, 170 members will be accommodated. Bus transportation to and from the generating station will be provided for the remainder of the members and guests.

A guided tour will be conducted through the American Sugar Refinery located east of New Orleans on the Mississippi River. This is the largest sugar refinery in the South and is exceeded in capacity by only one refinery in the United States. The tour will include the unloading of raw sugar, the refining process, the process for making lump sugar and the packaging plant. Transportation to and from the refinery will be by chartered bus, necessitating a charge of 50 cents per member.

Make Reservations Early

Nine New Orleans hotels are co-operating to meet the needs of members attending the meeting. They are: St. Charles, Roosevelt Jung, Lafayette, Pontchartrain, De Soto, New Orleans, Monteleone, and the LaSalle. Prices range from $3.50 to $12 per room, depending on the hotel and type of room. Members are urged to make requests for reservations at the New Orleans before Feb. 14. For aid in making reservations, write to Prof. J. Howell Peebles, Jr., College of Engineering, The Tulane University of Louisiana, New Orleans, La., giving first, second, and third choice of facilities desired.

A fee of $5 will be charged nonmembers for admission to one or all of the technical sessions, except in the following cases: authors of papers to be presented, or nonmember student aides. Guest-attendance cards have been discontinued. Admission will be by registration badge only.

The following committees are in charge of local arrangements: General Committee, M. C. Abrahm, chairman, and R. M. Seago, vice-chairman; Information and Registration, R. P. Lockett, Jr.; Reception Committee, L. J. Lassalle, chairman, and James M. Robert, co-chairman; Finance Committee, C. C. Crawford, chairman; Hotel Committee, J. Howell Peebles, Jr., chairman; Technical Events Committee, Waldemar Nelson, chairman; Inspection Trips, David Moodie; Printing and Signs Committee, L. H. Bohne, chairman; Entertainment Committee, A. W. Betz, chairman; Publicity Committee, C. L. Nairne, chairman; and Ladies' Committee, Mrs. George R. Hammett, chairman.

Twenty-Fourth Annual Meeting of the Woman's Auxiliary to the ASME

Mrs. Earl B. Smith Elected President for 1948

THE 68th Annual Meeting of the ASME was held at Atlantic City, N. J., Dec. 1–5, 1947, with the Philadelphia Section as host. Activities for all women attending the meeting were arranged and conducted by the Woman's Auxiliary to the Philadelphia Section.

During the meeting 300 women were registered by Mrs. George S. Gethen, chairman of registration. Welcoming the registrants were Mrs. H. I. Robinson, chairman of hostesses, and Mrs. W. M. Sheehan, chairman of membership and publicity.

The complimentary cocktail party on Monday Dec. 1, was the first of a series of general social events during which members and guests were able to renew old acquaintanceships and make new ones. In the evening *Life Magazine's* "New America" picturama was shown to capacity audiences of men and women. Also a bridge party, arranged by Mrs. G. H. Auth and Mrs. A. J. Johnson, attracted the bridge fans. Attractive door prizes were given away, as well as a prize for each table.

A trip to Deerfield Packing Plant at Bridgeton, N. J., was scheduled for Tuesday morning. Although the trip was arranged for the men, a number of ladies joined them. For those who did not go on the trip, educational films were shown through the courtesy of Westinghouse Electric Corporation.

The tea dance on Tuesday afternoon was the second general social event, with Mrs. Benjamin W. Webb as chairman. The tea table was decorated with a centerpiece of chrysanthemums and silver candelabra. Pouring first were Mrs. Eugene O'Brien and Mrs. E. G. Bailey, followed by Mms. Alexander Cowie, C. W. E. Clarke, Paul Thompson, J. W. Landis, W. M. Sheehan, and E. S. Bristol.

On Wednesday morning the annual meeting of the Woman's Auxiliary was called to order by Mrs. J. Noble Landis, the national president. The treasurer, Mrs. R. B. Purdy, reported a balance on hand as of Sept. 30, 1947, of $1026.19. A report from Mrs. Harold Erb, chairman of the Student Loan Fund, was read, stating that a total of $8862.81 was in this Fund. Mrs. W. E. Karg, chairman of the Calvin W. Rice Memorial Scholarship, reported that a student from Hungary, V. Szebehely, had been the recipient of the $500 award. Reports from the Sections and also from the officers and committee chairmen were presented.

The names of the officers chosen to serve on the National Board for 1948 were announced. They are: President, Mrs. Earl B. Smith; 1st vice-president, Mrs. C. Higbie Young; 2nd vice-president, Mrs. J. Page Harbeson, Jr.; 3d vice-president, Mrs. Charles M. Hickox; 4th vice-president, Mrs. A. B. Openshaw; 5th vice-president, Mrs. R. R. Robertson; recording secretary, Mrs. Charles Gladden; corresponding secretary, Mrs. F. W. Miller; treasurer, Mrs. R. B. Purdy; and assistant treasurer, Mrs. J. M. Labberton.

Following this meeting the Women's Luncheon was held, with Mrs. Allen W. Thorson in charge; the attendance totaled 134. Mrs. Thorson presented Mrs. E. S. Bristol, general chairman, Mr. O'Brien, and Mr. Bailey, and Mrs. Landis, who introduced Mrs. O'Brien, Mrs. Bailey, and Mrs. Smith, the newly elected president of the Auxiliary. Then Mrs. Thorson introduced Mrs. C. W. E. Clarke, vice-chairman, and others. Following the presentation of the guests of honor, Mrs. Thorson introduced Mr. Don Rose, columnist of *The Evening Bulletin* of Philadelphia, and world traveler, who spoke on "Twenty Years Later," discussing significant reminiscences and his experiences on a recent European journey.

The third general social event was the Annual Dinner and Honors Night, which concluded the formal part of the activities on the Women's Program. ELOISE T. BRISTOL.

Metropolitan Woman's Auxiliary Elects 1948 Officers

ON November 13 the New York Section of the Woman's Auxiliary met at headquarters for the Annual Business Meeting and election. The following officers were elected for 1948:

Chairman, Mrs. B. E. Toben; first vice-chairman, Mrs. H. R. Kessler; second vice-chairman, Mrs. J. H. Hoculi; third vice-chairman, Mrs. F. M. Farmer; recording secretary, Mrs. G. A. Harmon; corresponding secretary, Mrs. W. L. Iliff; and treasurer, Mrs. H. E. Erb.

A room filled to capacity greeted Mrs. Kessler, the speaker of the afternoon. She and her husband had just come off the boat after a six week's visit with relatives in France and the Low Countries. Mrs. Kessler described with humor and pathos the trials of living and traveling in postwar Europe.

She gave a firsthand picture of housekeeping problems and personal reactions to the privations of these impoverished countries. She told graphically of the ingenuity with which the people solved the multiple problems of living. The pathetic plight of the children was especially moving.

Puerto Rico Adopts ASME Boiler Code

THE Boiler Code Committee of The American Society of Mechanical Engineers was informed recently that Puerto Rico had adopted the ASME Boiler Construction Code and that in the future all boilers imported, manufactured, or repaired on that Island shall comply to Code rules.

The action was taken on Feb. 27, 1947, by the Board of Industrial Safety. The ASME Boiler Code rules will be included in the Board's rules currently under preparation.

German P. Nater, engineer chief of the division of accident prevention of the State Insurance Fund of Puerto Rico, was named by the Board as its representative to the Conference Committee of the ASME Boiler Code Committee. Each state or municipality which accepts one or more of the Code Sections is entitled to name a representative to the Conference Committee.

Indexes to Publications Available Upon Request

UNDER the new publications plan, separate indexes to MECHANICAL ENGINEERING for 1947 and to the Transactions of the ASME for 1947 will be available upon request to members of the Society.

Requests should be mailed to the Publication Sales, ASME, 29 West 39th Street, New York 18, N. Y.

Third Public Hearing Held on Section VIII of ASME Boiler Code

THE Boiler Code Committee of The American Society of Mechanical Engineers held its third public meeting on the proposed revisions to Section VIII, Unfired Pressure Vessels, of the Boiler Construction Code in the Engineering Societies Building, New York, N. Y., Nov. 19, 1947.

More than 85 engineers representing inspection agencies, unfired pressure-vessel users, and manufacturers were present to get the Boiler Committee's point of view on changes proposed and to make practical suggestions to expand the code's usefulness. Similar meetings were held earlier in the year at Houston, Texas, and Los Angeles, Calif.

The reception of the proposed changes was generally favorable. Most of the questioners asked for clarification of particular paragraphs. In most cases the members of the Committee who were present were able to direct attention to other parts of the code where the answer to the question was covered. Because the present code has found wide acceptance in industry, some engineers objected to major revision of the form of the code because of the confusion that may result.

H. B. Oatley, chairman of the ASME Boiler Code Committee, opened the meeting by extending a welcome to all present. He introduced E. R. Fish, who reviewed the history of the Code for Unfired Pressure Vessels.

The first code for unfired pressure vessels was published by the Society in 1915. It served industry well until 1937, when advances in the art had progressed to the stage where a complete rewriting of the code was considered. At that time a subcommittee was appointed to prepare the draft now under discussion. The proposed revision has been released to the public for criticism and is now in the final stages of the procedure used by the Society for adoption of a code.

Annual Student Luncheon Addressed by President O'Brien and President-Elect Bailey

THE traditional Members and Students Luncheon, held Wednesday, Dec. 3, was one of the most successful in years. More than 350 students and members sat down together to honor young engineers on the Society's 1947 honor list, to hear addresses by their presidents, but mostly to enjoy a good meal and to learn to know more of each other.

The luncheon was a stimulating human experience made possible by the Society's "Old Guard" and regular members who contributed toward the price of the dinner so that students can afford to attend. For more than two hours young men looked across the table tothe men they would someday be, and old men looked back to experiences long past. Sections, professional divisions, technical committees, and the whole structure of the professional organization seemed to dissolve into the simple human relation of young and not so young, devoted to a common ideal of professional attainment and public service. Once a year the Society looks upon its human material, declares it good, and takes pride in the future of its task.

Pattern of Society Changing

Alton C. Chick, retiring vice-president, ASME Region I, was toastmaster in the program which followed the dinner. He called attention to the changing pattern of the Society. While the Society was organized by mature men who had made their mark in the profession, he said, more than 50 per cent of the membership today is composed of men under 32 years of age. The Society now has 123 student branches and more than 10,000 student members. Within the next few years half of these may be expected to transfer to junior membership. The society must be prepared to gear its program for service to these young men.

Mr. Chick reviewed the history of the Members and Students Luncheon and told how its financial support comes from the "Old Guard," members who have paid dues for more than 35 years and continue to do so even though they are freed from this obligation, so that a fund can be maintained to support the luncheon and to provide awards to students. He said that members attending the luncheon also contribute to its costs.

Following his remarks, Mr. Chick introduced President O'Brien who presented a certificate of award to Lionel S. Marks in appreciation of his services as an ASME lecturer.

William R. Collier, student member, of Tufts College, was then called to receive the Undergraduate Award for his paper "Corrosion—A Design Problem." He was followed by Alvaro R. Boera, a graduate of the Stevens Institute of Technology, who was presented the Charles T. Main Award for his paper, "The Engineering Method—Its Value and Limitations." The awards were presented by Lawrence W. Wallace, Fellow ASME, who is chairman of the Board of Honors.

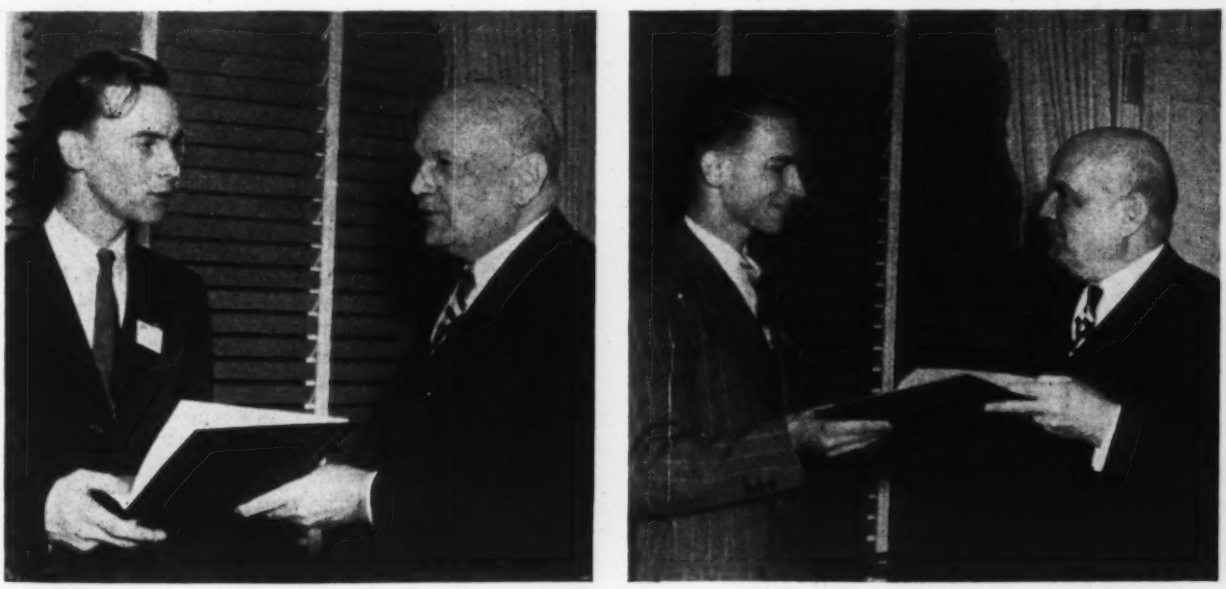
In a brief talk, Eugene W. O'Brien, retiring president ASME, characterized his administration as one of youth projects. He reviewed what had been accomplished for the young engineer through the Society's participation in the projects sponsored by the Engineers Joint Council. He mentioned the Taft-Hartley labor law which now protects the rights and privileges of engineers from the pressure of unions, the study of employer practices regarding young graduate engineers, and the comprehensive report "Engineers in Transition."

E. G. Bailey, president-elect ASME, complimented President O'Brien for his work in behalf of young engineers. He said the project was one close to his heart and that he will carry on. He was glad that the Society had a traditional Members and Students Luncheon because it represented a "reaching ahead and a reaching behind" a human experience which was "one of the most important things of the human race." Mr. Bailey urged the students to learn from the experiences of older members but cautioned them that "history does not repeat."

Young Engineers Cautioned

Referring to the depressionyears of the 1930's with their dearth of opportunity for engineers, he told the students that they were now riding on the crest of a wave, but he cautioned them not to climb too high. In choosing their job he asked them to be realists, to take into account that the current state of things is transient, and that the higher they climb the harder will be the fall. The prime consideration he said, was to choose jobs in which one can do the most good. His advice was warm as it was sincere.

More advice for the students came from Jacob P. Den Hartog, member ASME, recipient of the Richards Memorial Award, who read a series of proverbs from Benjamin Franklin's *Poor Richard's Almanac*. These pearls of wisdom covered the virtues of diligence, discretion, and silence, and they advised on how to choose and manage a wife.



WILLIAM R. COLLIER (*left*) RECIPIENT OF THE UNDERGRADUATE AWARD AND ALVARO R. BOERA (*right*) RECIPIENT OF THE CHARLES T. MAIN AWARD, RECEIVE CERTIFICATES FROM LAWRENCE W. WALLACE, CHAIRMAN, ASME BOARD OF HONORS, AT THE MEMBERS AND STUDENTS LUNCHEON ON WEDNESDAY, DEC. 3

ASME Nominating Committee Receiving Proposals for National Officers

THE 1948 National Nominating Committee of the Society is now receiving proposals for candidates for the offices to be filled during 1948, which are as follows:

President	To serve 1 year
Vice-President	To serve 2 years Region II
Vice-President	To serve 2 years Region IV
Vice-President	To serve 2 years Region VI
Vice-President	To serve 2 years Region VIII
Directors at large (2)	To serve 4 years

Early Action Requested

Proposals from the Society's membership will be welcomed by the Committee, and those who intend to submit them are urged to act promptly. Candidates' names and records should be submitted on the official proposal form which may be obtained from any member of the Nominating Committee as listed below. Completed forms should be sent to the Committee through its Secretary, Prof. H. L. Solberg, Purdue University, Lafayette, Ind., not later than April 1, 1948.

Before submitting the name of a candidate, his consent to serve should be obtained by the proposer. The proposer, not the candidate, should fill out the form. Members are reminded that, in accordance with the Society's Constitution, candidates for the office of President, Vice-President, and Director at Large shall be of the Grade of Fellow or Member of the Society.

Members wishing to orally support the candidacy of a proposed nominee will be given an opportunity to do so at the Committee's open hearings in Milwaukee during the Society's Semi-Annual Meeting.

1948 National Nominating Committee

REGION I

Lester C. Smith, Spencer Turbine Company, Hartford 6, Conn.
James A. Powell, *1st Alternate*, Stone and Webster Engineering Company, 49 Federal St., Boston 7, Mass.
T. A. Fearnside, *2nd Alternate*, Stone and Webster Engineering Company, 49 Federal St., Boston 7, Mass.
E. A. Harrington, *3rd Alternate*, 1500 Turks Head Building, Providence, R. I.

REGION II

R. W. Flynn, Gulf Oil Corporation, 17 Battery Place, New York 4, N. Y.
H. C. R. Carlson, *1st Alternate*, Charles Fischer Spring Company, 749 Atlantic Ave., Brooklyn, N. Y.
H. R. Kessler, *2nd Alternate*, Republic Flow Meters Corporation, 420 Lexington Ave., New York, N. Y.

REGION III

F. S. Erdman, College of Engineering, Cornell University, Ithaca, N. Y.
P. C. Osterman, *1st Alternate*, 19 Stile St., Elizabeth 3, N. J.
H. H. Snelling, *2nd Alternate*, Snelling and Hendricks, 900 F St., N.W., Washington 4, D. C.

REGION IV

Paul R. Yopp, Babcock and Wilcox Company, 1604 Candler Building, Atlanta 3, Ga.
S. B. Earle, *1st Alternate*, School of Engineering, Clemson College, S. C.
L. G. Haller, *2nd Alternate*, Tennessee Eastman Corporation, Kingsport, Tenn.

REGION V

H. S. Colby, Malleable Founders Society, 1800 Union Commerce Building, Cleveland 14, Ohio
D. S. Brown, *1st Alternate*, Cincinnati Gas and Electric Company, 4th and Main St., Cincinnati 2, Ohio
Paul R. Duffey, *2nd Alternate*, Youngstown Sheet and Tube Company, Youngstown, Ohio

REGION VI

H. L. Solberg, Head, School of Mechanical Engineering, Purdue University, Lafayette, Ind.
B. H. Jennings, *1st Alternate*, Department of Mechanical Engineering, Northwestern University, Evanston, Ill.
W. Lyle Borst, *2nd Alternate*, Power Service Corporation, 711 Wesley Temple Building, Minneapolis 4, Minn.

REGION VII

D. A. Elkins, U. S. Bureau of Mines, 1600 E. 1st South, Salt Lake City, Utah
Fairman B. Lee, *1st Alternate*, 905 Second Avenue Building, Seattle 4, Wash.
B. G. Dick, *2nd Alternate*, Department of Interior, Bonneville Power Administration, 1300 NE Union Ave., Portland, Ore.

REGION VIII

Orval L. Lewis, Jones and Laughlin Supply Company, 108 N. Trenton, Tulsa 2, Okla.
A. A. Woodward, *1st Alternate*, Public Service Company of Colorado, 900–15th St., Denver 2, Colo.
H. B. Atherton, *2nd Alternate*, Kansas City Power and Light Company, 1330 Baltimore Ave., Kansas City 1, Mo.

United Engineering Trustees Report for 1946–1947

Summary of Facts Concerning Finances, Building, Engineering Societies Library, and Engineering Foundation

THE Annual Report of the United Engineering Trustees, Inc., for 1946–1947 was issued on Nov. 20, 1947, by President J. P. H. Perry. Mr. Perry's report in somewhat abridged form follows:

Forty-Third Year

During our forty-three years just ended, we have felt the influence directly and through our Founder Societies, of the difficult postwar conditions of mounting wages, costs, and prices, with decreasing income from investments and other sources. Nevertheless, the work of UET has been carried on, I believe, to the general satisfaction of all those with whom it has contact. Probably the attention of our Board of Trustees has been directed primarily during the past two years to two matters—our building and pensions.

Engineering Societies Building

For several years past there has been increasing pressure on UET either to provide more space in the building at 29 W. 39th Street or to get a new home or at least to modernize the existing building. Two of our Founder Societies occupy extensive space outside the building. Other of our Founder Societies have given up using the building as headquarters for their annual meetings. Some of our Associated Societies either want more space or have left the building. After a long discussion and careful consideration, Trustees authorized the employment of a consulting engineer, Victor Mayper, of established reputation and demonstrated special ability in renovating old buildings.

Mr. Mayper, after months of study, rendered a comprehensive report which was adopted by the Trustees. His report was sent to the Founder Societies, because in the opinion of the Trustees it made sense in that it cleared the air in several directions as follows:

(1) To materially alter structurally the existing building, to make such radical changes as converting the auditorium into two additional floors of office space, to modify the entrance lobby and move the library to another location in the building, all of which had been contemplated or urged by some interested in the problem, was in Mr. Mayper's judgement both impractical and dangerous.

(2) To provide additional space which studies indicated might be needed five years or ten years or more from now, it appears to be necessary, according to this report, to buy the building from the American Radiator and Standard Sanitary Corp., immediately adjoining our building to the west, a building now known as the Haskins & Sells building. For months Trustees and Mr. Mayper were given to understand that this building could be bought at a reasonable price. Final inquiry a few months ago, uncovered the fact that this was not so and that the building was not available.

Engineering Societies Building office space is fully occupied and all meeting halls have been used extensively on weekday evenings, all at rates of assessment which have not been increased, notwithstanding increased costs of maintenance materials, and greatly increased wages dictated by labor board awards. The management is endeavoring to meet this advance by encouraging earlier evening meetings, thereby reducing overtime payments to elevator operators, mechanical staff, and others, as well as illumination costs, etc. In this, we acknowledge with appreciation, the cordial co-operation of the Societies.

A comparatively small amount of major repairs have been necessary this year, principally in renewing elevator machine parts on one of the passenger cars. A new1 6-mm sound motion-picture projector replaced the old 35-mm equipment in the auditorium. Additional facilities were made available in a rest room where increased personnel required it on the 12th floor.

Early this year, fire-insurance rates in Manhattan were increased. We have enjoyed on Engineering Societies Building for some years the lowest rates possible and continue to do so. The Board of Trustees has for some time foreseen a change in method under which we have been buying our fire insurance, and were fortunate in taking action only a few days prior to the advance in rates, to purchase a five-year policy under the old and lower rates, thereby guaranteeing a saving over that period. The building is adequately covered within the 80 per cent co-insurance clause, in keeping with current building-replacement costs.

Pensions

Early this year the American Institute of Mining and Metallurgical Engineers adopted a pension plan. The three other Founder Societies had taken similar actions previously. Two of the Founder Societies' plans are of the pension-trust type, the other two of the insurance-plan annuity type. With the four Founder Societies having adopted pension plans it was not difficult for us at our September, 1947, meeting to adopt a pension system covering the employees of the Corporation and Engineering Societies Library and Engineering Foundation. Our plan, which became effective October 1, 1947, is of the pension-trust type.

You would all be interested to know, I am sure, that the 51 employees of UET, including the administrative and building staff, the Library and the Foundation combined, have an average record, as of September 30, 1947, of continuous service in our employ, of 9½ years. It is also interesting that of these 51 employees 49 per cent are women.

Financial Matters

The Corporation lists among its assets, the cost ($1,993,793.92) of Engineering Societies Building depreciated by a fund which on September 30, 1947, was $621,890.19. This property is listed on the city assessment rolls at $910,000, of which the land is valued at $410,000, leaving $500,000 as the assessed value of Engineering Societies Building. It remains exempt from taxation. It has also sole ownership of the corpus of certain funds, the income of which is designated by deed of gift for the operation of Engineering Societies Library, and of Engineering Foundation. Its has also the funds of the John Fritz Medal Board of Award and the Daniel Guggenheim Medal Board of Award, and is designated as treasurer and custodian of Engineers' Council for Professional Development. The amounts of these various funds are listed on the balance sheet attached to the report.

It has always been the policy of the Corporation to purchase securities of the best quality and to hold until maturity, except when it is indicated that the quality of the portfolio can be improved by a change. Comparatively little selling or buying has been done in the year just ended. In any transaction, and in continuing vigilance over the portfolio, we have the able advice of our financial counsel, W. Barton Cummings, vice-president and personal trust officer of Chemical Bank and Trust Company; and of our investment advisers, Wood, Struthers and Company, especially of M. S. Harrison of that firm.

Audit was made twice during the year by Haskins & Sells, certified public accountants. A copy of their certificate verifying the correctness of the books and all transactions as of the end of the fiscal year, together with a copy of the balance sheet, is made a part of and is attached to the report. The aggregate book value of our capital-fund investments on September 30, 1947, the close of our fiscal year, was $1,751,106.84 with a market value of $1,853,261.97 or 106 per cent of book value (which is the value at which the items went into the portfolio whether by purchase or gift). The previous year we had 105 per cent.

Professional advisers have been retained by the Board to guide us in special problems, as follows: Financial counsel, W. Barton Cummings, vice-president of Chemical Bank and Trust Company; investment advisers, Wood, Struthers and Company, M. S. Harrison, partner; legal counsel, Carter, Ledyard and Milburn; architects, Shreve, Lamb & Harmon; insurance, Frank & Du Bois; and certified public accountants, Haskins & Sells.

Engineering Societies Library and Engineering Foundation

The Library activities have not decreased with the cessation of wartime demands. Visitors (readers) numbered 23,557 during the year, compared with 23,000 the previous year. Of those 16,098 were served by mail, against 14,750 the year before, and 7,358 by telephone. Photostats numbering 53,597 were furnished on 4392 orders. Translations to the extent of 136,192 words were furnished, contrasted with 218,577 words the year previous. So much business by mail shows the wide use of Engineering Societies Library. It is proper to note that books were borrowed for use outside the premises, many being shipped to all parts of the country.

Considerable attention has been given to financing Engineering Societies Library as one of the greatest free, public, engineering libraries in the world and it is hoped that adequate support may soon be forthcoming as befits such an institution.

Detailed report of the Library Operations by the Librarian, Ralph H. Phelps, is appended hereto.

The Engineering Foundation, during the war, operated under a policy of undertaking only such projects as contributed to the successful completion of the war. With the national interest turning to peacetime research, the Foundation has received many calls for financial assistance. Our Founder Societies all have shown increased interest in their own research programs, and have called for considerably more financial aid from the Engineering Foundation.

The Engineering Foundation is beneficiary, under the will of G. D. Barron, of 5000 shares of the Cyprus Mines Corporation, whose mines are in the Island of Cyprus, which he is reported to have valued for tax purposes, at $100 per share. When Ambrose Swasey made his gifts which total nearly $1,000,000, he expressed the hope that they would be only the beginning of a great Engineering Foundation. The next generous bequest was that of Edwin H. McHenry whose estate was appraised at $400,000 in 1931 with Engineering foundation as residuary legatee. Mr. Barron's generous gift is a welcome addition and it is hoped that such an example may prompt more gifts of this magnitude in order that our Engineering Foundation may be in a position to expand its valuable work.

Detailed report of Foundation activities of interest to ASME members is reviewed elsewhere in this report.

The Engineering Societies Library

IN his annual report to the Library Board, Ralph H. Phelps, director, Engineering Societies Library, New York, N. Y., stated:

The outstanding feature of the thirty-fourth Library year, 1946–1947, was thorough study of the Library, made by the Committee on Library Objectives and Development, E. F. Church, Jr., chairman. The report on this study includes a statement of the objective of the Library, reports the present status of the Library, considers its future possibilities, and recommends actions to meet its needs.

The report shows that since 1941 the cost of important items in the Library budget have increased from 50 to 65 per cent, but in the same period Library income has increased only 18 per cent. It has been possible to avoid severe curtailment of Library activities only by the use of credit balances accumulated during the war years.

It lists library services and gives a table showing that the use of these has, on the average, increased 25 per cent in the last two years. This figure was based on an estimate. Final figures now show that the increase is twenty per cent. It also shows that the staff is inadequate, that salaries are too low and are not comparable to Founder Society salaries, that more space for shelving is needed, that the book and periodical collections require strengthening, and is also recommends a program of publicity and promotion to increase the usefulness of the Library.

A large amount of work went into the study and the preparation of the report, which is the most comprehensive report ever made on the Library. Whether the work will prove to have been worth while, whether the report will be of great or little value, is dependent on the extent of the action taken to make the recommendations effective.

Use of the Library

Library use was five per cent greater this year than last year. Especially important is the nine per cent growth in use of the Library by nonvisitors, indicating, as it does, the widespread use of the Library. Forty per cent of Library users in 1946–1947 did not visit the Library.

Statistics of library use follow:

		Per cent change from last year
Visitors served, total	23,557	+ 2
Non-visitors served, total	16,098	+ 9
Total	39,655	+ 5
Photostat orders	4,392	+10
Photostat prints	53,597	+12
Microfilm orders	114	+33
Searches	140	
Translations	45	—41
Words translated	136,192	—38
Borrowers	1,835	+46
Books lent	2,628	+48
Telephone inquiries	7,358	+10
Letters written (exclusive of book orders)	3,214	+28

Pensions

The United Engineering Trustees, Inc., at its September 25 meeting, adopted a pension plan that includes Library employees. The plan calls for contributions by both the employees and the Library. The plan will be of great benefit to Library employees, especially the older members of the staff. There are now five who have served over twenty-five years. The Library's payments to the plan are considerably increased by the accrued liability for these and other long-time employees.

Personnel

Ralph H. Phelps, who was acting director, was made director. John J. Soroka was appointed as head of the search department. Staff turnover has been considerable but on the whole probably less than last year, and, in general, new staff members are superior to those they replace. Staff problems are fully dealt with in the report of the Committee on Library Objectives and Development.

Farmington Plan

Careful consideration was given to this plan, which is a comprehensive "Proposal for the division of responsibility among American libraries in the acquisition and recording of library materials." By this plan at least one copy of every book or pamphlet published anywhere in the world which might reasonably be expected to have an interest to a research worker in America, is to be acquired, made available in some participating library, and listed in the Union Catalog at the Library of Congress. For the present, the plan is limited to current materials in the Latin alphabet. To be consistent, the Engineering Societies Library would have to cover at least the four fields of the Founder Societies if it undertook any. Initial cost would be about $1000 a year, but it would increase to possibly $10,000 a year. On account of space limitations, as well as for financial reasons, the Library regretfully declined participation in this meritorious undertaking.

Service Bureau Rates

As the search and translation services were operating at about a twenty per cent loss under 1940 rates, the rates were raised as follows: Searches from $2.50 to $3.00 per hour. Translations: German, French, from $1.00 to $1.50 per hundred words; Russian, Swedish, from $1.20 to $2.00 per hundred words.

In the case of searches, the charge is made only for the hours spent on the job, but the income must cover a large amount of preliminary correspondence and estimating. Much of this does not actually result in any paid work for the Service Bureau.

Even with the increased rates the Service Bureau does not quite "break even" on this work but there is reason to believe that it will be able to do so.

The income from photostats more than covers the loss on searches and translations.

Acquisitions, Cataloguing, and Binding

During the year 8081 volumes, pamphlets, and maps were received. Of these, 5095 were added to the Library. The remainder, being duplicates or works of no value to the Library, were given to other libraries or reserved for sale or exchange as opportunity arises.

In addition to the above, several thousand reports were received from the Office of Scientific Research and Development, and from the National Advisory Committee for Aeronautics. These wartime reports that have been released since the end of the war were not included in the above figures, because, although the material is roughly sorted and can be used with difficulty, it is not yet catalogued.

Several hundred foreign-language wartime books have also been received through the Library of Congress. For the most part these have not been added to the collection as the cataloguing, which is being done by many libraries on a co-operative basis, is not complete. The co-operative cataloguing done by this Library on these books, has been very time-consuming because of the detail required by the Library of Congress.

During the last four years the binding of periodicals had fallen far behind. This situation is now being corrected but will require much more work. To improve the handling of periodicals, a Kardex Check file has been partly set up. This is now taking considerable time but should save time and improve service in the long run.

The total resources at the close of the year were 164,051 volumes, 10,316 maps, and 4943 searches, a total of 179,310 items.

As in the past the Library has received many valuable gifts of books and magazines. This year there were no very unusual gifts but some of the more useful ones were those from the following: E. C. Brown, C. W. Franklin, F. T. Sisco, A. Ekwall, and A. E. Wheeler. Many gifts of Founder Society publications were received in response to requests published in the Founder Society journals. Those covering the war years are especially useful for exchange purposes.

Various technical societies, publishers, and other organizations have given generously of their own publications and other publications that have come to them.

The Library is, as always, enriched by the gifts received. Our sincere thanks to all donors.

The Engineering Foundation

IN their annual report to the United Engineering Trustees, Inc., A. B. Kinzel, chairman, and Edwin H. Colpitts, director, of The Engineering Foundation, stated:

The Engineering Foundation, a department of United Engineering Trustees, Inc., was established in 1914 and completed its thirty-third fiscal year on September 30, 1947.

The accompanying financial statement summarizes the present capital funds of the Foundation, and the income and expenditures during the year. The book value of the capital funds of the Foundation on September 30, 1947, was $936,623.70 as compared with $944,242.28 on September 30, 1946. The income for the fiscal year 1946–1947 was $33,893.85 as compared with $33,850.21 for the previous year 1945–1946. For the fiscal year 1946–1947 disbursements amounted to $28,971.29 as compared with $32,511.23 for the year 1945–1946. The balance on September 30, 1947, was $53,138.06 as compared with $48,215.50 on September 30, 1946.

As the technical report following the financial statement indicates, the Foundation has continued support and sponsorship of research projects in various fields of engineering and in addition has assisted the program of the Engineers' Council for Professional Development having for its objective the general advancement of the Engineering profession. In selection of research projects to be supported preference has been given to those of a more fundamental nature which would not be undertaken by an industrial research organization.

Where projects, such as those of the Research Council on Riveted and Bolted Structural Joints, the Column Research Council, the Welding Research Council, and the Alloys of Iron Committee, are of interest to a group of industries, the Foundation has provided a limited financial support and a sponsorship intended to enable the principal support of the project to be secured from interested industries and other sources. To an important extent, therefore, grants of the Foundation merely supplement larger amounts secured from other sources and in particular the contributions of the organization carrying on the research.

These latter contributions are most commonly laboratory and office space, testing facilities, technical direction of project, etc., and may if evaluated well constitute in amount many times the grant of the Foundation. Thus supplemented the relatively small grants of the Foundation can become most effective.

While plans for Government support of research have not taken final form, the Armed Services have during the year continued to support a wide variety of research projects under contracts with universities and others. So far this program of the Armed Services has in no way indicated that organizations such as the Foundation cannot continue to serve importantly within the limits of their financial resources.

For the year 1946–1947, grants were made in support of thirteen projects. These projects are covered in the report on current activities. For the year 1947–1948, grants are recommended to enable continuation of nine projects and for the support of eight new projects.

The following projects are those in which the ASME is particularly interested:

Metal Cutting Data and Bibliography, Project 63.

Chairman, M. E. Martellotti, member ASME, research engineer, Cincinnati Milling Machine Company, Cincinnati, Ohio.

The objectives of this project were a revision of the Manual on Cutting of Metals and the preparation of a Bibliography on Cutting of Metals. The Bibliography has been completed, published, and added to the ASME list of publications. As to progress upon the Manual, the chairman reports that the Committee held meetings on December 3, 1946, and on June 16, 1947. The primary object of these meetings was to discuss the material intended for inclusion in the revised manual and to report the progress made in the compilation of material by the members of the committee. It appears that of the 21 chapters, 18 have been practically completed and the three remaining are in process of being compiled. All written material should be available by the end of this calendar year or earlier, but editing will be required to co-ordinate the chapters and to include in the revised manual some of the material of the previous edition.

Rolling Friction, Project 89.

Chairman, H. Weisberg, member ASME, Public Service Electric and Gas Company, Newark, N. J.

This project is under the direct sponsorship of the ASME Research Committee and is being executed under the supervision of M. D. Hersey, Fellow ASME. The report indicates that studies have continued along the lines fully described in the annual report for last year. Information being compiled falls into two parts: (1) Specific results on the rolling friction of car wheels on steel rails, from unpublished Bureau of Mines experiments, and (2) a general survey of the theory and laws of rolling friction and published experimental data from all sources. A technical paper is planned soon to cover the methods and results of (1).

Many difficulties have been met in computing rolling friction under light loads, including questions of air resistance and suspected changes in the grade of the track. Much painstaking work has been completed in measuring and rechecking chronograph records.

Informal progress reports have been submitted as follows: (1) Bibliography, January, 1947; (2) Rolling Friction Measurement, February, 1947; (3) Determination of Deceleration from Chronograph Records, February, 1947; and (4) Preliminary Tests on Mine Car Wheels, July, 1947.

It is expected that the final report on rolling friction will be ready for presentation early in 1948.

Properties of Gases and Gas Mixtures, Project 91.

Chairman, J. A. Goff, University of Pennsylvania, Philadelphia, Pa.

The Foundation undertook to assist in the support of this research project provided that substantial financial support was secured from other sources. Later, as it appeared that much exploratory work should be undertaken before experimentation could be begun, the Foundation grant for the present fiscal year was reduced in amount and the condition removed that other support be obtained. As will appear from the following, the year's work has involved an analysis of the problem and an attempt to select more definite objectives.

Three meetings of the committee were held during the past year. Decision was reached to concentrate attention of the committee on thirteen technically important gases, seven thermodynamic and four nonthermodynamic properties. In preparation for technical sessions at the Annual Meeting in 1947, the committee has accumulated a number of indications from industry relative to the priorities with respect to gases, properties, temperature and pressure ranges which in turn can be employed in formulating its program. Likewise, as a result of a questionnaire, it has been possible to determine what work is presently under way or planned in some forty laboratories in the United States. In further preparing for the technical sessions, a good start has been made in determining the present state of knowledge in this field.

The committee has generally outlined its experimental and computational program to include: (1) A critical study of existing gas-properties data, with subsequent interim publication of the best of these data for the gases chosen; (2) a determination of accurate spectroscopic constants of the gases in question where they are not available, or where they are of questionable value; (3) a systematic recalculation of zero-pressure properties where improved computational accuracy is considered necessary, and the derivation of zero-pressure properties from accurate spectroscopic constants where this work has not been done; and (4) an extension of the data to finite pressures.

The development of a plan to approach industry for funds to support the work program is well under way, and its completion is anticipated by January 1, 1948.

During the past year Professors F. G. Keyes and J. H. Keenan of the Massachusetts Institute of Technology were appointed to the committee.

"Accent on Youth"

THIS phrase was the title of former President O'Brien's speech at the Annual Banquet at Atlantic City on Dec. 3. Mr. O'Brien's speech in its entirety is published elsewhere in MECHANICAL ENGINEERING (see pages 5 to 7 of this issue) but it's importance to juniors is such that we feel we must comment on it in our *Forum*.

Mr. O'Brien is one of the very few men who really knows young engineers. Any young man who has actually met Gene, as he is affectionately called, knows what we mean by this. He is not a stiff shirt in any sense of the word. He is really human and will go out of his way to make a Junior feel that he really belongs. He is a source of inspiration to many of us and we have evidence of this by knowing of the countless number of letters he receives from young engineers. How that man can remember all the faces and names that he does is a source of wonderment to all.

We mention this as we want you to know that here is a man to whom we should listen when he talks as we know that he speaks with authority. Therefore when he states that it is his belief that the greatest concern of our Society should be the proper professional and human development of the young engineer, we should sit up and take notice.

We younger men must realize that we constitute a very substantial proportion of our Society's membership and therefore must help our Society by helping ourselves. Mr. O'Brien tells of the many things that young engineers want as a result of his observations. He mentions that we want protection against unionization, against a poor public opinion, a faulty economic system, and many other things. He calls on older engineers to give us the guidance we so sorely need. All right, our seniors are beginning to work in this direction and now it is up to us to fall in line and give them and ourselves the support we all need.

How can we do this is going to be the first question asked of us and the answer is forthcoming and that is: Take an active role in Society affairs. No man, and we shall repeat, no man regardless of status or location can offer an excuse for not taking some small part in our activities. Let us elaborate further: Do you have a local Junior Group? If you do then go out and support it. If you don't, why not investigate and see what the chances are for forming one? The new Junior Committee is giving you a push in this direction by the issuance of a new pamphlet entitled "It's Up to You" which has been mailed to all juniors and which tells you how to organize a new Junior Group. If for any reason you have not received this booklet, or if you need extras, they may be obtained by writing the *Forum*.

Suppose that neither of the above is the case with you, and that there isn't a Junior Group in your area or a new one is not feasible, then what? There are many other means of doing something we could suggest, such as acting as a reporter or feature writer for the *Forum*, serving as a junior adviser on a national committee, contributing to some active committee by corresponding with it, presenting papers, giving a talk before a local section. You tell us your preference and we shall tell you what to do.

Yes, men, today the Society stress is an "accent on youth" so let us hear from you telling us that you are behind this new program and want to do your share.—C. H. CARMAN, JR.

ASME Junior Forum

COMPILED AND EDITED BY A COMMITTEE OF JUNIOR MEMBERS, C. H. CARMAN, JR, CHAIRMAN

Junior Program Wins Full Support at Annual Meeting

THAT the junior member is no longer the forgotten man of the Society was demonstrated at the Annual Meeting in Atlantic City. President O'Brien devoted his presidential address to a review of actions taken by the Society in the interest of the young engineer. In a symposium on the introduction of the junior engineer to his Society, his job and community, leaders in the Society suggested a definite approach to this problem for both juniors and members. The Junior Committee, marking one year of work, looked back with satisfaction to a few modest achievements and ahead to an agenda full of promise. But most encouraging was the response of juniors themselves, who met informally to take note that a program designed for their aid has the support of the whole Society.

You may not have been present at the Annual Meeting, but you can know what took place and what was said, because these events are reported fully in the following pages of your *Forum*.

Juniors Hold Informal Meeting

TWENTY-ONE junior and student members from five regions of the Society met in Room 323 of the Haddon Hall Hotel during the Annual Meeting in Atlantic City, N. J., to talk over the objectives of the Junior Committee and to define policy for the *Junior Forum*.

Two points, in effect, a vote of confidence in actions already taken, were established: (1) That the locus of interest of junior members is different from that of the older members and ought be reflected in junior-group organizations and in activities planned and conducted by junior members; and (2) that the *Junior Forum* has a definite function to perform and ought to be continued as a service to junior members.

The meeting was called by a blackboard notice at the registration desk, by announcement at all technical sessions and by word of mouth during the cocktail party Monday evening. When C. H. Carman, Jr., chairman of the editorial committee of the *Junior Forum*, called the meeting to order junior members were lining the walls and covering the furniture.

The discussion ranged freely over the whole field of junior-member interest. Certain opinions were sought and from time to time the discussion was directed back to the main points on which some expression of opinion was sought.

Frank Opinions Sought

Mr. Carman asked for frank comment on the *Junior Forum*. He said the first issues had been primarily the effort of the Metropolitan Section. He regretted this because the *Forum* needs broad participation by juniors in all Sections. The editorial committee needs guidance, he said.

His committee did not know whether the *Forum* in form or content was acceptable to juniors. If the *Forum* serves no useful function it should be discontinued because it is costly to the Society and a considerable sacrifice on the part of his committee.

To his appeal, members present were quick to respond. The *Forum* had been read by many and the impression was favorable. Glenn R. Fryling of the New Haven Section, said that the *Forum* was the first evidence he had that the Society was doing something for the young engineer. It was giving him an outlet of his own where a continuing record of his thinking can be made available for juniors and members alike. The *Forum*, he said, ought to be continued in spite of the lack of response to the early issues. It was his opinion that the forum idea needs time for development and would be noticed soon and used by juniors for their advantage.

Forum Difficulties Reviewed

Mr. Carman reviewed the difficulties experienced by the editorial committee in getting juniors to write about the professional matters which concern them. If the committee were to judge from its correspondence it would have to conclude that there were no problems confronting the young engineer, he said. This he knew was not true and asked for comment and suggestions on the kind of material that would best serve as grist for the editorial mill.

John H. Prentiss of the Metropolitan Section described what his Section was doing by way of a comprehensive review of the place of the young engineer in the Society. A major problem, he said was one of winning employers over to the practice of encouraging junior members on their staffs to participate in Society affairs by making it easy for them to take time off for committee meetings. He mentioned especially the occasional use of an extended lunch hour for this purpose. He asked juniors to read an editorial on that subject which would appear in the January issue of MECHANICAL ENGINEERING.

More Junior Activities Urged

Albert Schade, 3rd, of the Philadelphia Section, referred to the havoc wrought by the war on junior-group activities. His own junior group was all but shattered, but has been reorganized recently and is now sponsoring a full program. His group was anxious, he said, to communicate with juniors in other sections to plan a co-ordinated national junior program. Properly planned, such projects can aid considerably in adding profit and pleasure to Society junior activities. He cited the work

THE JUNIOR MEETING IN FULL SWING

(*Left to right:* R. H. Eldridge, student member, Tufts College, Medford, Mass.; D. K. Wright, Jr., associate professor of Machine Design, Case Institute of Technology, Cleveland, Ohio; C. H. Carman, Jr., chairman, *Junior Forum* Editorial committee; Albert Schade, 3rd, United Engineers and Constructors, Inc., Philadelphia, Pa.; and Glenn R. Fryling Wescott and Mapes, Inc., New Haven, Conn.)

JUNIOR MEMBERS AND STUDENTS WHO TOOK PART IN THE INFORMAL DISCUSSION ON THE JUNIOR COMMITTEE AND THE *Junior Forum*

done jointly by his and the Metropolitan Junior Groups in providing student aids for the Annual Meeting. In this instance the job could not have been done by the Philadelphia Group alone, but the joint effort was one of the features of the Annual Meeting. The *Forum*, he said, could serve as a vehicle of communication among juniors over the country. It can encourage juniors in large Sections to form Junior Groups. It can inform juniors on matters of interest to them and help to create a bond of belonging in areas where junior-group activities are not practicable.

Students Are Concern of Juniors

Mr. Schade urged juniors to look to students in near-by universities as a profitable field for junior activities. A major service to the Society, he said, was one of welcoming students after graduation and introducing them into the professional activities of the ASME.

His section, he said, recently completed an organization chart for junior-group activities. He outlined the plan and showed how it could be used to stimulate interest in the sections. The plan will be reviewed later in the *Forum*.

D. K. Wright, Jr., of the Cleveland Section, brought up the question whether it was wise for juniors to function as a unit apart from the older members of the society. In the Cleveland Section, junior members participate in the affairs of the Society on an equal basis. Many hold administrative offices and carry the full responsibility of the Section program.

Results Encouraging

In summing up the discussion, Mr. Carman said that he was encouraged by the interest shown in the Junior Committee and the *Forum*. It was clear that juniors are awake to opportunities for service provided by the Society. He invited juniors to organize contributing editorial committees to work with his group in editing the *Forum*. With that kind of backing his committee can promote the *Forum* in full confidence that the effort is not in vain. The meeting was adjourned after which the group gathered in the corridor to be photographed.

Education Session Reviews Junior Problems

ON Tuesday, Dec. 2, the Education Committee sponsored a symposium of "The Introduction of the Junior Engineer to: His Society, His Job, His Community." The divisions of the subject were discussed in turn by A. C. Chick,[1] E. C. Koerper,[2] and L. J. Fletcher.[3]

Mr. Chick remarked that juniors seek a common ground on which to meet and work with other juniors as well as older members of the Society. He feels that any program offered by the Society should be such that it will provide an opportunity for young men to share in creating and absorbing the various activities presented. In other words, only by taking an active part can the junior member appreciate the value of Society work.

Membership Growing Younger

Mr. Chick also pointed out that the pattern of our membership is changing. Today its principal growth is through the transfer from student to junior-member grade and that if the present pace is continued, within the next two years juniors (under 32 years of age) may represent 50 per cent of the total membership. In view of this it is readily seen that an adequate student-branch and junior program must be fostered to insure the young man's place in our Society. Further, this program must be understood and backed by all in the Society so that much-needed encouragement to young engineers will always be in the offing.

In discussing the introduction of the junior to his job, Mr. Koerper pointed out that most young engineers after leaving college have what he termed a "lack of experience." By this he meant it takes time for a young engineer to acquire a practical knowledge which he really must have; also, young engineers must acquire an industrial outlook or point of view on various problems. Since most of us at college are taught to use formulas without any special adaptation we have to be shown how this material really ties in. We must also adapt ourselves to industrial short cuts and to be able to develop new ones. Lastly, we must realize the economic aspects of business. Too often this is lost sight of when we become entangled in the intricacies of design.

Older Members Can Assist

In order to help acquire the above, Mr. Koerper pointed out, the older men can be of great assistance. The employer can introduce the young engineer to his job through effective training courses which will bring these points to light. Continual guidance should be maintained after the training period is over. He points out that an engineer must be given proper recognition for his work and be shown that he is an essential part of the company's efforts.

The last speaker was Mr. Fletcher who, as stated previously, concerned himself with the introduction of the junior engineer to his community. This is an important phase of our training as too often we are referred to as a people apart. Mr. Fletcher tells us that modern community life calls for the application of engineering principles in the solution of its problems. The engineer, with his habit of analyzing, factual thinking, and effective presentation, has a growing place in the fields

[1] Past Vice-president, ASME, assistant vice-president, Engineering Manufacturers Mutual Fire Insurance Company, Providence, R. I.

[2] Jun. ASME, A. O. Smith Corporation, Milwaukee, Wis.

[3] Mem. ASME, Director of Training and Community Relations, Caterpillar Tractor Company, Peoria, Ill.

of social service. Further, the junior engineer is especially benefited from such work. The field is a wide one and some of the suggested areas are church men's clubs, YMCA, Boy Scouts, community-fund committees, civic boards, political organizations, and many more. All of these groups will welcome any assistance that is offered them. He shows us that by being active in such groups not only will we aid ourselves but we will be doing a real service to our community. Today one of the greatest dangers facing our country is the growing mistrust and misunderstanding developing between our rapidly increasing number of groups and specialists. If everyone knew just what his fellow man was engaged in, there would be a better understanding of his problems and harmony in our society.

Help From Management Needed

To help accomplish this young engineers need help from management to encourage them into these fields; they need its "official sanction" so to speak. To Mr. Fletcher's way of thinking, this in turn would repay management as it would help young men understand the system which for years has served to give us our high standards of living.

After the speakers had finished, a lively discussion led by Chairman A. C. Monteith ensued. All in all, it was an excellent session for a junior engineer and we hope there will be many more of this type on our panels in the future. C. H. C.

Junior Committee Completes First Year

THE Junior Committee met on December 2 at the Annual Meeting in Atlantic City.

The pamphlet "It's Up to You" and the accompanying letter from President O'Brien which were sent to all junior members were discussed. Before proceeding further in this direction it was decided to wait and see what response was evoked from the members.

The next step in this process of trying to help the young engineer to help himself will be a program of direct personal correspondence with each Section and Junior Group chairman. However, this will not be undertaken until the reaction from the pamphlet can be evaluated.

The *Junior Forum* was discussed extensively and the conclusion was reached that it can be a vital help to all junior members. The extent of this help will depend on each individual and the geographic scope from which the material is contributed. Therefore this will be tied in with personal correspondence and a strong effort will be made to find at least one man in each Section who will be willing to accept definite writing assignments.

Society Leads in Aid to Juniors

A report on the activity of juniors in other societies was submitted and studied. Apparently the ASME is the only Founder Society which has so far undertaken a real junior program. The AIEE in Philadelphia puts on a series of meetings for juniors but they are organized entirely by senior members. The ASCE has no junior classification. The SAE has a junior classification and invites participation in committee work but does not have any separate meetings.

Action on a summary of the report "The Engineering Profession in Transition" was postponed until the next meeting to give the committee a chance to study it.

The new EJC Canon of Ethics, which was referred to the Committee by the Metropolitan Junior Group for consideration of the employer-employee relationship, has been returned to them for recommendations.

The next meeting was set for 2:00 p.m. Jan. 18, 1948, at the Societies headquarters in New York, N. Y. D. E. J.

Here's Opportunity

FOR one interested in ASME Power Test Codes and their use in the field of power generation, there is an opportunity on the staff of the Society. The ASME Power Test Codes Committee is looking for a secretary. He could be a junior member 25 to 32 years of age, who is now located in the metropolitan area. Write to the secretary of the Society for an appointment.

Pan-American Engineering Congress Announced

UNITED STATES engineers will join with engineers of South America in a Pan-American Engineering Congress, to be held in South America late in 1948 or in 1949, it was announced recently by the Engineers Joint Council Committee on International Relations. Canadian engineers also will be invited to participate through The Engineering Institute of Canada.

In a recent meeting of the Executive Board of Committee on International Relations pledging full support to the congress, J. S. Thompson of the McGraw-Hill Book Company, Inc., New York, N. Y., was named to represent the Council at a planning meeting, which was held in Lima, Peru, November 28. He also attended part of the general meeting of UNESCO in Mexico City Nov. 6–Dec. 3, 1947.

S. S. Steinberg, dean, University of Maryland, chairman of the Commission on Latin America of the Committee on International Relations, who has spent much time in contact with South American engineers, stressed their great desire for such a Western-Hemisphere congress, and the mutual benefits that would accrue to all countries taking part.

Bogota, Colombia, has been suggested as the place for the first congress.

Participation will be recommended to all constituent societies of the Engineers Joint Council. These include the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, American Institute of Electrical Engineers, and American Institute of Chemical Engineers.

E. E. Aldrin to Serve Congressional Board

THE appointment of Colonel Edwin E. Aldrin, member ASME, of Montclair, N. J., as executive secretary of the Subcommittee on Manufacturing of the Congressional Aviation Policy Board, was announced recently.

Colonel Aldrin, well-known in aviation circles, is a New Jersey aviation commissioner and was formerly manager of the Newark Airport, Newark, N. J.

Colonel Aldrin is on loan from the Atlas Supply Company of Newark, N. J. A command pilot in the Air Forces Reserve, Colonel Aldrin has served with distinction in the Air Forces of this country for many years. He holds a degree of doctor of science in aviation engineering from the Massachusetts Institute of Technology.

His job will be to secure, co-ordinate, and analyze information sought by the subcommittee and its advisory board, as it performs its function with the board in the preparation of the report to the Congress which will be required of it on March 1, 1948.

B. A. Bakhmeteff's Paper Wins ASCE Award

THE Norman Medal of the American Society of Civil Engineers will be awarded to Boris Alexander Bakhmeteff, member ASME, professor, Columbia University, New York, N. Y., and to William Allan, dean, school of technology, College of the City of New York, N. Y., for their paper, "The Mechanism of Energy Loss in Fluid Friction," which was judged the best published in the 1946 Transactions of the ASCE. The joint award will be made at the annual meeting of the society in New York, N. Y., Jan. 21, 1948.

ASME Calendar

of Coming Events

Jan. 12–16, 1948
Materials Handling & Management Division Meeting
Cleveland, Ohio.

March 1–5, 1948
ASME Spring Meeting
New Orleans, La.

May 20–23, 1948
Oil and Gas Power Division Meeting
St. Louis, Mo.

May 30–June 5, 1948
ASME Semi-Annual Meeting
Milwaukee, Wis.

Sept., 1948
ASME Fall Meeting
Portland, Ore.

Nov. 28–Dec. 4, 1948
ASME Annual Meeting
New York, N. Y.

Sections

Food and Soil Fertility Discussed at ASME Chicago Section Meeting

PREVENTION of erosion and conservation of the fertility of food producing soils was called an engineering problem of prime and urgent importance by Sir Herbert Gepp. He spoke before 500 engineers and guests at a meeting of the Chicago Section of The American Society of Mechanical Engineers held Nov. 13, 1947, in the pump room of the Chicago Filtration Plant, Chicago, Ill. The meeting was part of the ceremonies which marked the inauguration of service of new filtration equipment. Prior to the meeting, Sir Gepp opened the valve and placed the new equipment in operation.

Sir Gepp's remarks on the engineer's responsibility for maintenance of human life were part of his review of observations made during a five months' visit to Europe. Food problems in Europe have been aggravated by the worst drought stretching from Italy to Scandinavia in over 100 years. More serious is the fear that the present drought is but the beginning of a long period of low rainfall which, according to some researchers, has afflicted Europe about every 800 years.

He classified the raw materials used by the world into those which are crops maturing over a period of years, and those which Providence has provided over the milleniums. Engineers, he said, tend to give too much consideration to the utilization of materials of the second class and tend to overlook the basic fact that engineering is concerned also with the efficient production of the primary needs of the human body.

He cited China as an extraordinary country in which the people have learned how to support a tremendous population on a closed cycle of soil productivity. In China, when the land has produced the food and the people have eaten it, the residue is carefully returned to the soil, where, with the aid of rainfall and atmospheric nitrogen and oxygen, food is again grown and so *ad infinitum*.

The so-called civilized peoples have no real conception of a closed system. Instead of returning residues of food to the land they waste them by disposal into the ocean or discharge the elements into the atmosphere by burning. Even the mineral residues are wasted into the rivers or the sea.

"One of the most productive small areas of the world of which I know is a few thousand acres of land situated some 30 miles from the city of Melbourne in Australia—a city with a population of a million people—upon which the whole sewerage of this city is used. I have actually seen crops of grass hay weighing 3 tons of dry hay to the acre being taken off this irrigated land. And one of the interesting points in this connection is that the chemists say that the high productivity is due, to a material extent, to the supply from the sewerage of the city of the necessary small quantities of various rare elements which are not supplied either from ordinary soil or from the fertilizers which are added to the soil."

Anthracite-Lehigh Valley Section Hears Talk by Application Engineer

On Oct. 24 at the Hotel Sterling, Wilkes-Barre, Pa., 40 members and 3 visitors heard a talk "Modern Diesel-Electric Locomotive," by Thomas J. Woods, application engineer, Westinghouse Electric Corporation. Slides showing modern Diesel-electric locomotives from smallest to largest, were shown, with detailed description and specific application of each. Mr. Woods also gave a description of modern steam locomotives.

Birmingham Section Hears Three Speakers

On Oct. 20 at the Bankhead Hotel, Birmingham, Ala., with 100 in attendance, three speakers, representatives of pipe-producing companies in Birmingham area, A. T. McWane, Herbert Stuart, and Kenneth Daniel, discussed "Centrifugal Casting of Iron Pipe." This meeting was in a series on "Know Your Home Industry."

The talks were devoted to the history and manufacturing methods of cast-iron pipe. The meeting was concluded with a question-and-answer period during which the speakers elaborated on particular technical problems involved.

Boston Section Has Talk on Brazed and Welded Tubing

On Nov. 20 at the Massachusetts Institute of Technology, Cambridge, Mass., R. I. Hahn, of the Rochester Division, General Motors Corporation, gave a talk entitled "Manufacture of Small Sizes of Brazed and Welded Tubing." Mr. Hahn explained in detail the method of making small-sized brazed tubing of double-wall type from two pieces of flat strip stack. The problems solved in its development and the equipment used were adequately discussed. A similar discussion on welded steel tubing (up to $^{9}/_{16}$ in. diam) followed. The limitations in dimensions and the uses of the material in the automotive and refrigeration fields were presented. Numerous clear slides and samples of the tubing were shown. An interesting discussion followed.

SPEAKERS' TABLE AT THE CHICAGO SECTION DINNER MEETING HELD AT THE CHICAGO FILTRATION PLANT, NOV. 13, 1947.
(*Left to right:* A. B. Openshaw, J. R. Baylis, C. C. Austin, Sir Herbert Gepp, W. H. Oldacre, T. S. McEwan, W. W. DeBerard, Robert Krause, and H. H. Gerstein.)

"Technology Tomorrow" Subject at Central Iowa Section

On Nov. 20 at Iowa State College, Ames, Iowa, Prof. Baldwin Woods spoke on "Technology Tomorrow." This was a review of the great inventions and discoveries of the past, and of the past fifteen years, followed by a discussion of the probable trend of invention and discovery for the near future.

Dr. R. V. Kleinschmidt at Central Pennsylvania Section

On Nov. 12 at Pennsylvania State College, State College, Pa., an audience of 70 heard Dr. R. V. Kleinschmidt, member ASME, talk on "Applications of Compression Distillation." Dr. Kleinschmidt traced the development of the vapor-compression apparatus for distilling pure water, showed the applications to both Naval and civilian use, and gave data relating to design and performance features of the unit.

Atomic Energy Discussed at Cincinnati Section

On Nov. 6 in the Engineering Societies Building, Cincinnati, Ohio, a joint meeting of the Section and the Engineering Society of Cincinnati was held, with 243 present. Jerry De Croce, of the Westinghouse Electric Corporation, spoke on "Atomic Energy—Tool or Weapon?" Mr. De Croce gave an excellent talk, illustrated with slides, on the basic concepts of atomic energy and its uses in the world tomorrow. Dinner preceded the talk, and at that time a color motion picture entitled "Operation Crossroads" was shown, illustrating the Navy's "A" bomb tests at Bikini Atoll.

Dr. Emil Ott Speaker at Detroit Section

Forty members and 10 visitors attended the meeting on Nov. 11 at the Engineering Society of Detroit, Detroit, Mich. A dinner preceded the program. Dr. Emil Ott, of the Hercules Powder Company, gave a talk on "What Makes a Plastic a Plastic." Dr. Ott showed that plastic materials all have one thing in common, that is, their molecules are hundreds or thousands of times as large as the common organic molecules.

Joint Dinner Meeting of Kansas City Section and Student Branches

On Nov. 7 a dinner meeting was held in the Memorial Union Building, Kansas University, Lawrence, Kans. At that time the Section and the ASME student branch from Kansas State College were guests of the ASME branch of Kansas University. Student chairman Sells of the Kansas University branch presided, and introduced Professor Daasch who welcomed the group to the university campus. The following were introduced: Professor Helander, Professor Brainard, Mr. Manuel, Mr. McDonald, Dean Durland, and Mr. Hadley. The guest speaker was Ernest E. Howard, senior partner of Howard, Needles, Tammer and Bergendoff, chairman of the Board of Trustees of Kansas City University, and a nationally prominent engineer. His subject was "Early Construction Materials." The audience numbered 180.

New Haven Section Enjoys Talk by F. G. Tattnall

Thirty-five members and 15 guests met in the United Illuminating Company building, New Haven, Conn., on Nov. 12, to hear Francis G. Tattnall, of the Baldwin Locomotive Company, speak on "Making Structures Stronger by Making Them Lighter." Mr. Tattnall was lively, witty, and thoroughly conversant with his topic.

Linn Helander Speaks at Two North Texas Section Meetings

Linn Helander, vice-president, ASME Region VIII, addressed two section meetings, one in Dallas, Texas, on Nov. 17, and the other in Lubbock, Texas, on Nov. 18. Both of these meetings were devoted to a discussion of ASME activities, organization, and publications.

Heliarc Welding, Subject at Ontario Section

On Nov. 13, at Hart House, University of Toronto, R. J. Anderson spoke to an audience of 62 on "Heliarc Welding of Nonferrous Materials and Alloy Steels." The talk dealt with the welding of aluminum, magnesium, and stainless steel by the Heliarc process and the applications of the process found in various industries.

Oregon Section Makes Plant Trip

On Oct. 30 a dinner meeting was held at Burns' Restaurant, Portland, Ore., attended by 30 members and 10 guests. R. J. Sweeney, sales manager for the Franz Bakery, was the speaker. Following dinner, the group toured the plant of the Franz Bakery, and viewed the mechanization, said to be the most modern on the Pacific Coast. This was the first in a series of "Know Your Home Town Industry" plant tours.

On Nov. 19 Henry L. Burns spoke on "Application of Engineering to Aviation Physiology" at the Gasco Utilization Building, Portland, Ore. The program followed an informal dinner. Mr. Burns explained the procedures of research development as practiced at Wright Field, and more specifically the development of the cycling value resuscitator used in high-altitude flying and adaptable for mine and water rescue. The equipment was demonstrated.

Peninsula Section Has Smoker

On Nov. 18 a smoker was held, in Grand Rapids, Mich., with 24 present. Dean H. B. Dirks, of the Michigan State College, spoke on the future of engineering and made comparisons with other types of education.

Carrier Air Operators Talk at Philadelphia Section

On Oct. 28 at the Engineers Club, Philadelphia, Pa., Lt. Comdr. David Berger, USNR, gave a talk on "Carrier Air Operators—Two Years After." Commander Berger compared carrier operations in the early part of the war with the vastly improved and implemented air offensive launched from carriers in the latter stage of the war. He also told of the tremendous damage suffered by the USS *Franklin*. One hundred and twenty were present.

On Nov. 18 the Professional Divisions of the Section held a meeting at the University of Pennsylvania, Philadelphia, Pa., with 70 members and guests present. Joseph J. Manuele, Jr., associate ASME, director of quality control, Westinghouse Electric Corporation, gave an excellent talk entitled "Quality Control as a Management Tool," outlining the progress, features, and future of this phase of engineering. Mr. Manuele said that quality control is fast approaching the status of a true profession and should no longer be represented as a statistical study carried on as a by-product of a benevolent management. Like the thermometer on the wall, it is an indicator. He further said that quality control belongs in the tool kit of the industrial engineer; it must be built into a product, not inspected into it; through observation, inspection of 100 per cent of all pieces will catch 80 to 85 per cent of all defectives; quality control can give 100 per cent good pieces without inspection.

Piedmont - North Carolina Section Presents Award to F. R. Jackson

On Nov. 14 at the Robert E. Lee Hotel, Winston-Salem, N. C., 33 members and 77 visitors heard C. W. Reynolds, superintendent of manufacturing engineering, Western Electric Company, speak on "Some Problems in Connection With Moving an Industry." Mr. Reynolds said that by the end of 1947 Western Electric will have about double the plant space in North Carolina the firm sought when it first moved south. This is because business has exceeded expectations. The company began moving radio shops to North Carolina in April, 1946. The necessary space was found in two plants, one in Burlington and one in the present Chatham Road plant in Winston-Salem. Now the company has eight plants in North Carolina, grown from the original two and placed near them. The moving job is almost completed, said Mr. Reynolds. He explained that the purpose of his talk was to eulogize the engineer, and show the necessity

of engineering in moving and keeping a plant operating. F. Raymond Jackson of Charlotte, N. C., immediate past-chairman of the Section, was presented with an award in recognition of his services by E. E. Williams, vice-president, ASME Region IV. Max Thomason, present chairman of the Section, presided at the meeting.

Westmoreland Committee Starts New Season

The Westmoreland Committee of the ASME Pittsburgh Section held its first dinner meeting on Oct. 14 at the Mountain View Hotel, near Greensburg, Pa. The meeting was devoted to the subject of the mechanization of coal mining, and conducted by William B. Jamison, Jamison Coal and Coke Company. The speakers were: W. T. Ferguson, Goodman Manufacturing Company, who gave a talk on "On-Track Mining;" W. T. Wearly, Joy Manufacturing Company, who spoke on "Trackless Mining;" and E. H. Hebden, Jeffrey Manufacturing Company, whose talk was on "Conveyer Mining."

The second meeting was held on Nov. 13. Verle H. Erickson, chief metallurgist, Snap-On Tools, Inc., Kenosha, Wis., gave a talk on "Heat-Treating With a Controlled Quench." Attendance at each meeting was about 90.

Officers elected last spring for the present season are: W. L. Kennicott, chairman; Hunt Davis, vice-chairman; R. W. Erhard, secretary; W. K. Bodger, treasurer.

In addition to the regular series of technical meetings, it is planned to conduct closed meetings of members at which the younger men will be encouraged to present short papers. The presentation and organization of the papers will then be criticized freely by the audience. It is hoped that these meetings will be popular and worth while in improving the quality of technical papers presented at future meetings.

Servomechanisms Discussed at Plainfield Section

On Nov. 19 at the Elizabeth Elks Club, Elizabeth, N. J., 68 members and guests heard a talk by T. M. Berry of the General Electric Company, entitled "Servomechanisms." The speaker showed slides of a number of industrial applications of servomechanisms and applications in the field of measurements. He described their construction and operation, and application problems were discussed.

Rochester Section Hears Talk on Stainless Steel

On Nov. 13 at the Hotel Sheraton, Rochester, N. Y., an audience of 35 members and 30 guests heard a talk "Stainless Steel—Its Properties, and Its Importance in Industrial Applications," by Erick Von Hambach. Twenty-five years' experience in the field has given Mr. Von Hambach a wealth of practical information on the design and production of stainless-steel parts. He explained a simple classification of the forty designated types, describing their properties, specific applications, and suitable machining methods.

Wage Incentives Subject at South Texas Section

On Nov. 12 at the Houston Engineers Club, Houston, Texas, 36 members and 4 guests heard C. H. Elliott, of the Reed Roller Bit Company, give a talk on "Wage Incentives." Mr. Elliott explained the basic requirements of effective wage-incentive plans, the steps involved in initiating such a plan, problems and mistakes frequently encountered, and solutions which produce a mutually satisfactory system. A discussion period followed.

Latin-American Industry Topic at St. Louis Section

On Nov. 21 at the Forest Park Hotel, St. Louis, Mo., "Trends and Factors in the Industrialization of Latin America" were discussed by John L. Gillis. The speaker said that Latin-American countries are industrializing to avoid having their needs cut off in case of another war. In some instances, he said, owing to lack of natural resources, this program is being carried on without regard for economics. Twenty-five were present.

Talks on Carpet Making at Schenectady Section

Forty members and guests heard a talk on "Technical Aspects of Carpet Making," by Ralph E. Meyers and E. D. Friderici, Mohawk Carpet Mills, at the WGY, Studio A, Schenectady, N.Y., on Nov. 20. Using slides, Mr. Meyers told how a carpet is made, starting from the raw material to the finished product. Mr. Friderici, chief chemist of the Mohawk Carpet Mills, told of the work of the technical people employed by his company. A good discussion, lead by the two speakers, rounded out the meeting.

Southern California Section Has Two November Meetings

On Nov. 4 in room 134, Chemistry Building, University of California, Berkeley, Calif., an audience of 78 heard Prof. R. G. Folsom, member ASME, associate professor mechanical engineering at the University, speak on "Mixing Fluids by Inductors." Professor Folsom, who is a noted authority on jet pumps, told of present solutions to the problems of mixing and agitating fluids by inductors, and explained why they work and how they work.

Fifty-four members and 50 guests enjoyed exceptional technicolor movies taken in the Philippines, China, Siam, Australia, New Zealand, and Hawaii, by Clay T. Colley, member ASME, engineer, Link Belt Company, Los Angeles, Calif., at the Rio Hondo Country Club, Downey, Calif., on Nov. 10. While showing the photographs, Mr. Colley gave interesting sidelights and comments.

Southern Tier Section Meets With Students

On Oct. 23 in Olin Hall, Cornell University, Ithaca, N. Y., 40 members and 100 students heard a talk on "Principles of Automatic Control," by G. F. Akins, engineering staff, Eastman Kodak Company, Rochester, N. Y. This talk was presented from the user's viewpoint, with excellent demonstration equipment, of the characteristics and disadvantages of various automatic-type controls, ranging from simple "on-off" through "anticipator"-type action as applied to industrial processing.

A dinner meeting was held on Nov. 24 at the State Technical Institute. The speaker was R.E.W. Harrison, vice-president of the Chambersburg Engineering Company, Chambersburg, Pa., and Fellow ASME. Mr. Harrison told the forty members and guests that at present America's most important weapons are the atom bomb and the gas turbine. He said that forgings produce the best possible physical properties in metal; that the gas turbine is primarily forgings, most of them being made to a very high degree of accuracy. Even though England and Russia adopted American forging techniques as far back as 1937, the speaker said, we still lead the world in quantity and quality of forgings. Tracing the history of forgings, Mr. Harrison described the early forging techniques as exemplified by the Spanish and Damascan swordmakers. Impact forming has always predominated in the manufacturing processes involving armament, and much of the progress of forging technique was due to the constant research of the gun factories, the audience was told. Forgings, said Mr. Harrison, by bringing out the best properties of metals, allow a great reduction in weight which gives vehicles greater speed for a smaller expenditure of power, as shown by the current use of many forgings in automobiles and planes.

Jet Propulsion Subject at Virginia Section

On Oct. 31 at Ewart's Cafeteria, Richmond, Va., an audience of 140 heard R. E. Small, junior member ASME, General Electric Company, discuss "Jet Propulsion." After giving the history and development of the jet turbine, Mr. Small showed a film and slides which covered the engine and jet-propelled airplanes. These were followed by a discussion of improvement of existing designs and research activities for future designs.

Western Washington Section Visits Aircraft Plant

On Nov. 5 a field trip was made through the plant of the Boeing Aircraft Company, Seattle, Wash., by 125 members and 125 guests. After an excellent meal in the Boeing cafeteria, the members, their wives, and guests were conducted in small groups throughout the several departments of the company, and shown design, assembly manufacture, testing, research on jet planes, new Boeing Stratocruiser, and many other types of planes. The large wind tunnel for stress studies was also seen.

Student Branches

University of Akron Branch

On Nov. 13 a meeting was held with 22 members present. This was the opening rally, and was largely organizational and inspirational. Chairman Robert J. Harry appointed a program committee, headed by Eli Solop, and a trips committee headed by Richard L. Fleshman. Prof. W. M. Petry, honorary chairman, explained the organization of the ASME and its benefits. He emphasized the benefits to be had in presenting technical papers and the awards and prizes offered. He urged all members to begin preparing at once for the competition. A movie entitled "The Inside Story" was shown. It was made by the Socony-Vacuum Oil Company, and explained the properties of lubricants required by modern machinery.

On Nov. 20 an inspection trip was made to the Gorge Power Plant, Akron, Ohio. Mr. Dietrich, assistant superintendent of the plant, described in detail the design and operation of their new boiler. Small groups, with a guide, then inspected the plant from coal bunkers to condensers, and each operation was carefully explained. A unique feature of the trip was the comparison of a turbogenerator installed in 1942 and one installed in 1914.

University of Arizona Branch

The dance held by the engineering societies during the week of Nov. 10 was a great success and one of the nicest affairs ever held by any school group at the University. A small profit was also realized.

At the meeting on Nov. 20 in the Engineering Building, Robert Brown, chairman, an ex-colonel in the Air Forces, spoke on "Jet Propulsion" and some of the newer aircraft. A series of large charts on this subject had been made available to chairman Brown by Professor Thornburg.

On Nov. 25 the film "Report on Jet Propulsion" was shown before 40 members. This film was made by the Bell Aircraft Corporation, and explained the principles of jet propulsion simply.

University of Alabama Branch

On Oct. 9 in room 214, Engineering Building, a meeting was held, attended by 45. The honorary chairman, Prof. D. H. Shenk, member ASME, was introduced, and gave a welcoming speech to all present, and then introduced some of the mechanical engineering faculty present. One of the new members of the faculty is Prof. F. R. O'Brien, who worked in Oak Ridge, Tenn., during the war. Dr. J. M. Gallalee, member ASME, was then presented to the audience. He explained what every member should expect and should give to the ASME. He encouraged the promotion of more inspection trips and mentioned several places that he would be willing to arrange for the group to visit.

An inspection trip was made on Oct. 18 to the Southern Research Institute, Birmingham, Ala. Twenty members were shown what was going on in research in the well-equipped analytical laboratories, the heat pump, and various other sponsored special projects. The trip afforded firsthand information in research to the members.

Clarkson College Branch

On Nov. 13 a meeting was held with 127 present. General business and plans for a field trip to Utica, N. Y., were discussed. The pamphlet "Research Looks to New Horizons," published by the General Motors Corporation, was distributed. A movie by the Yarway Company was shown, entitled "There's an Engineering Reason." Membership cards were distributed to members enrolled at the previous meeting, and registration was held for new members.

Carnegie Institute of Technology Branch

On Nov. 19 a meeting was held in Industries Hall. Prof. W. S. McKee, member ASME, honorary chairman, and Prof. F. W. Hoye, member ASME, were guests. Two interesting movies were shown: the first, "The History of Alloy Steels;" and the second, "The Internal-Combustion Engine." The following students were the lucky recipients of the ASME Mechanical Catalog and Directory when Professor Hoye drew their names from a hat: R. G. Best, S. West, H. D. Ege, M. A. Crossey, R. Cross, and D. Meyers. Professor Hoye, a graduate of Annapolis, naval commander in the recent war, and a new member of the faculty, gave a talk on the comparison of education at the academy to that obtained at a civilian technical school such as Carnegie Tech. He spoke of the cadet's life as he progresses through school. Fifty-seven were present.

Clemson College Branch

On Nov. 11 the meeting was opened by Philip Klinck, chairman. Paul Barton, chairman of the program committee, spoke on student technical papers, and discussed the benefits of writing and presenting such papers to the Society and also to the student himself. G. A. Bradley gave a report concerning the meeting of the Greenville ASME branch to which student members were invited to attend. The speaker was Prof. E. E. Waite, head of the psychology and sociology department at Clemson. He spoke on the subject of "What Is Lacking in an Engineering Education." Fifty-two were present.

University of Colorado Branch

The fall term was started with the most extensive membership campaign in the history of the branch, organized by George E. M. Stevens, membership chairman. During fall registration a table was set up where all mechanical and aeronautical engineers could fill out application blanks and pay annual dues. To date there are 174 paid-up members, with more applications still being filled.

On Oct. 3 the ASME branch sponsored the first all-school dance under the direction of Bill Ranney, publicity chairman. The dance was held in the Memorial Student Union Building.

The first business meeting was held on Oct. 8 in the Chapel of Old Main. Bill Ranney gave a report on the dance. Ray Horner announced cash awards available to members for the writing of technical papers. Dean C. L. Eckel of the college of engineering, gave a short talk on the qualifications of an engineer. Prof. B. H. Spurlock, junior member ASME, faculty adviser, introduced Robert F. Throne, member ASME, superintendent of steam production of the Colorado Public Service Company. Mr. Throne, an active member of the Denver Section, spoke on the advantages of membership in ASME. A movie "Calvalcade of Aviation" was shown. This film depicted the history of aviation from the Wright Brothers to World War II.

Under the direction of Claire Iverson, the branch put on a skit at the Annual Engineers' Apple Fest. This skit, entitled "Baby Photographer," was written by Dick Winters. Harry McKeever played the part of the baby photographer.

THE FIRST ALL-SCHOOL DANCE SPONSORED BY UNIVERSITY OF COLORADO BRANCH

Columbia University (Mechanical Division) Branch

The first meeting of the year was held on Oct. 8. The following officers were elected: Moses M. Malkin, president; John A. Tillinghast, vice-president; Frank W. Oppenheimer, secretary; George H. Snyder, treasurer; and Robert C. Huber, historian. Prof. V. E. Scottron, junior member ASME, honorary chairman, gave a short talk on the objectives of the branch. Two films were shown; the first, of Camp Columbia, Columbia University Summer Engineering Camp, taken by Varne Kimmick; the second, a film produced by the Combustion Engineering Corporation on the production and installation of steam-power generating equipment.

On Oct. 23 a meeting was held in 428 Pupin, with 45 present. Prof. William A. Hadley, junior member ASME, lead a job forum and discussed job opportunities in industry, civil service, private practice, and teaching. He outlined the requirements and prospects for jobs in design, production, sales engineering, plant engineering, and research and development. A discussion period followed.

Cooper Union (Evening School) Branch

The first meeting of the current school year was held on Oct. 29 in the lecture room of the Engineering Building, with 48 present.

General Electric film "Jet Propulsion," was shown. Following that, an organization meeting was held, when plans for the branch were discussed.

Cornell University Branch

On Sept. 30, 1947, Miss Shirley A. Ogren of Cornell University Branch was awarded the ASME certificate for outstanding efforts and accomplishments on behalf of the branch, and became the first woman in any ASME student branch to receive this certificate.

Miss Ogren was awarded the certificate on the basis of a single term's work as secretary-treasurer of the branch. During her term in office she contributed much time and effort to building the membership of the branch to an all-time high of 185—all this in addition to the usual routine duties of office. Miss Ogren is tops in other fields, too. Scholastically she stands at the head of the senior class; this has been her way of doing things ever since she went to Cornell to study engineering in June, 1944. Pi Omicron, Women's Engineering Honorary Society, claims her as president, and Delta Gamma Sorority elected her to serve as treasurer for one year. Tau Beta Pi has recognized her abilities by awarding her the Women's Badge. Not satisfied, however, with these extracurricula activities, Shirley Ogren has also found time to earn part of her expenses as a receptionist, library assistant, theater projectionist, and student assistant in the department of engineering materials.

SHIRLEY A. OGREN, CORNELL UNIVERSITY STUDENT BRANCH

University of Delaware Branch

On Nov. 11 a meeting was held in the Engineering Building with 22 present. Prof. J. I. Clower, member ASME, honorary chairman, urged members to attend the convention to be held in Atlantic City. The chairman, John R. Dick, introduced Messrs. Bartlett and Gray, sales engineers of the Worthington Pump and Machinery Corporation. Mr. Gray spoke of some of the products manufactured by his organization. Samples and illustrative literature were examined by the members. A film entitled "Hydro-Barking" was shown. Mr. Bartlett then led a discussion concerning the Hydro-Barker and other related equipment.

Drexel Institute of Technology Branch

A regular business meeting was held on Nov. 12 in the Student Building. The program consisted of talks by Messrs. Reynolds and Jennings, both of Leeds and Northrup Instrument Company, who spoke on "Purchasing Considerations." Mr. Reynolds explained the position that purchasing has in an organization, while Mr. Jennings dealt with problems confronted by liaison men between engineering and purchasing departments. A discussion period followed.

Duke University Branch

An organization and recruiting meeting was held on Oct. 14. Joel E. Martin, president of the branch, presided. Prof. F. J. Reed, member ASME, honorary chairman, was unable to be present and his place was taken by Mr. Boutwell who gave a summary of the advantages accruing to members of the ASME now and in the future after graduation. Murray Huntoon, treasurer, gave a report of finances.

The meeting on Oct. 28 was attended by 35 members and 25 visitors. Professor Reed introduced the guest speaker, John May. Mr. May gave a talk on "Mechanisms and Their Application in Industry." He illustrated his talk with "mock ups" of mechanisms, elementary and complex. Among them were yokes, Geneva wheels, gears, cams, timing devices, and various combinations of these. He explained the problems, methods of attack, and results in industry of studies in mechanisms.

On Nov. 11 the meeting was called to order by J. E. Martin, chairman. Handbooks entitled "Wrought Iron" sent by A. S. Byers Company, makers of wrought-iron products, were distributed. The book was sent as supplementary information to the movies which were shown for the evening's program. These were "Tornado in a Box," from Allis-Chalmers Company; and "The Manufacture of Wrought-Iron Pipe" from A. S. Byers Company. Thirty-eight were present.

At the meeting on Nov. 25, with 34 present, Harry Griese gave a report of his trip to Purdue, Lafayette, Ind., as a delegate from the local chapter of Pi Tau Sigma to the national convention there. He said that he found Duke University college of engineering compared very favorably with other engineering colleges in regard to equipment, courses, and professors. The guest speaker was William Hardy, who gave a talk on his experiences with submarines during World War II, including methods of propulsion, control, and uses of the submarines. The speaker concluded with some interesting personal side lights and answered many questions.

University of Florida Branch

On Oct. 23 a meeting was held in the Student Union Building with 33 present. John M. Redgrave, an alumnus of the university and an employee of the Georgia Power Company, gave an interesting talk on what an engineer should get from his education.

The meeting on Nov. 6 was held in Temporary Building F. Student member, Robert L. Olive, gave a short chalk talk on the planned engineering building for the university. Prof. N. C. Ebaugh, member ASME, faculty adviser, supplemented the talk at the request of Mr. Olive. A moving picture on the development of the automobile engine was shown.

George Washington University Branch

A regular monthly meeting was held on Nov. 5 with 50 members present. Committees and chairmen were appointed as follows: James Sinsabaugh, program; Ray Coulombe, budget; Arthur Brown, inspection trips; Norman Ziegler, publicity; Ben Sorin, social; John Koche, refreshments; Matt Polk, membership. Ray Coulombe was elected treasurer to replace Bill Gaines. Arthur Brown described a field trip made by the members the previous week to the Washington Gas Light Company's plant, where they saw at firsthand the manufacture of artificial gas. Following the business meeting, about 35 AIEE students joined the meeting, and the audience enjoyed two films; the first, "Modern Mariners," a Diesel film loaned by General Electric, and the second, "Helicopter," a color film loaned by Bell Aircraft Corporation.

A regular monthly meeting was held on Dec. 3 in room 101, Government Building. Wm. Mayer of A. M. Byers Company, Baltimore, Md., gave a talk on wrought iron and presented a motion picture entitled "Eternally Yours." In addition, he spoke at length on "Radiant Panel Heating" using slides for demonstration. A general discussion and question period followed. One hundred and twenty-five members and guests were present.

As has been the custom for the last 25 years the engineers procured and set up the campus Christmas tree for the ceremonies on Dec. 15 at 5:30 p.m. Dean F. M. Feiker introduced President C. H. Marvin who lighted the tree, while the Glee Club sang Christmas carols. The ceremonies were dedicated to the memory of Prof. Alfred Hitchcock who originated the idea.

Johns Hopkins University Branch

On Oct. 31 a meeting was held in Maryland Hall, attended by 55 members and 5 guests.

The speaker was Ensign Richard Hodges of the Armed Forces Special Weapons Section. He spoke on the effects of radiation due to atomic bombing on a large city such as Baltimore, Md. He had a Geiger counter and a flag which had been exposed to one of the bombs at Bikini, and showed how the Geiger counter clicking increased when the sensitive element was moved over various sections of the flag. He also spoke about the differences in effect between internal and external radiation, and the fact that in the near future there will be launched by the Atomic Energy Commission an educational program to have the American people realize that some form of protection against the effects of atomic radiation must be found.

Another meeting was held on Nov. 3, with 45 members present. The program consisted of a film by the Combustion Engineering Company, entitled "Steam Progress." This was in technicolor.

University of Idaho Branch

On Nov. 10 in the Engineering Building, a film on the New York Central Railroad was shown. James Miller reported the progress that was being made on the program for the Annual Engineers Ball. Kenneth Niebauer, chairman, appointed a committee to plan a field trip to Spokane, Wash., for the purpose of acquainting the student engineers with the local industries, and Roland Hughes was made chairman of this committee.

University of Illinois (Navy Pier Division) Branch

The first meeting of the season was held on Nov. 12 in room 204, Navy Pier. The following were elected to office: Joseph S. McCaffrey, chairman; Gerald E. Lerman, vice-chairman; Lambert J. Kilory, Jr., secretary; and Edw. Harper, treasurer. Volunteers were asked to act on the following committees: publicity, program, social, field trip, membership. Mr. MacDonald spoke on the duties of these committees. Thirty-one were present.

Illinois Institute of Technology

On Nov. 18 a meeting was held in North Union Building with 155 present. Photoelasticity and stress concentration were the subjects of a talk given by Dr. Max M. Frocht of the I I T and Armour Research Foundation. Dr. Frocht presented a nonmathematical analysis of the stress-concentration problems encountered in machine design and illustrated his talk with polarized-light photographs of actual plastic models under stress. Pi Tau Sigma, national honorary mechanical-engineering fraternity, presented its annual award of an ASME membership to Sidney Jeffe, outstanding freshman of last year's class. The award was made by Howard Olsen, award-committee chairman, in the fraternity's behalf. "As a result of the current semester's membership drive," announced I. C. Hamilton, president of the branch, "the present number of student members has been raised to 230, making the I I T branch one of the largest in the country."

Iowa State College Branch

A combined meeting was held with the Central Iowa Section and the ASHVE on Nov. 20, when a banquet was served in the south ballroom, Memorial Union. After the banquet the three groups adjourned for their respective business meetings. Reports were made by various chairmen. Later in the evening the three groups again met to hear a talk entitled "Technology Tomorrow" by Dr. R. W. Wood, president of ASHVE. One hundred and twenty members and 80 visitors attended the meeting.

University of Kansas Branch

The branch was host to the Kansas State student branch and the Kansas City Section at a joint banquet on Nov. 7 in Memorial Union Building, where a group of 171 enjoyed the banquet in the lavish Kansas room. John Sells, president of the University of Kansas branch, was toastmaster. The welcoming address was made by faculty adviser, Prof. Harry L. Daasch, member ASME. Three vocal numbers were given by Miss Eileen Horner. The guest speaker was E. E. Howard, consulting engineer from Kansas City, who talked on "Early Construction Materials." He took his audience back through the ages and showed the development and uses of petroleum and bitumen products as time progressed. After the banquet the University's mechanical laboratories were opened for inspection by the visiting ASME members.

University of Kentucky Branch

On Oct. 2 in the training-school auditorium, the officers of the branch were introduced to new members. Prof. W. M. Carter explained the membership rules and the president, J. L. Morrissey, outlined the objectives of the branch.

At the Oct. 16 meeting the following committees were appointed: social committee: Bartley Greenwell, chairman, Harry Lawson and Fauntly Foley; attendance committee: Raymond Warner, chairman, and Fred M. Mahan; publicity committee: Eugene Amburgey, chairman, and Earl Boggs; program committee: Warren Gordonwood, chairman, Eugene Amburgey, and Robert L. Paris; election chairman: Eugene Amburgey. Professor Carter read the names of the men who were eligible to become members in the parent society of ASME. A motion picture "Steel—Man's Servant," was shown.

A regular meeting was held on Oct. 23. Prof. C. E. Youngblood explained the purposes of the mechanical-engineering honorary society, Pi Tau Sigma, and announced that pledging would take place on Oct. 30. Professor Penrod, head of the mechanical-engineering department, addressed the audience. Prof. W. M. Carter read a list of the present Class A members of ASME and urged other engineering students to become such members. Mr. Willis, president of Pi Lambda chapter of Pi Tau Sigma fraternity, made a short speech pertaining to the history and purpose of his organization. The present members of Pi Lambda chapter were introduced, after which a tapping exercise was held. The following mechanical-engineering students were tapped: J. M. Mahan, Eugene Amburgey, M. E. Sulzer, E. A. McBride, M. J. Evans, W. F. Savage, D. M. Hysinger, D. A. Robbins, R. F. Olson, L. S. Haynes, Franklin Taul, and E. E. Williams.

The meeting on Nov. 13 was held in the training-school auditorium with 225 present. The entire meeting was devoted to an address by Charles Boggs, a senior student at the University, who has just returned from a tour of Europe. His subject was "Who's Subversive?"

Lehigh University Branch

At the Oct. 30 meeting in Packard Auditorium before an audience of 60 members and 40 guests, Dr. Loyal A. Shoudy, head of Bethlehem Steel Company's local dispensary, spoke on "Some Aspects of Human Engineering." Dr. Shoudy, a pioneer in industrial medicine and a research worker in industrial hazards, emphasized employer-employee relationships. Following the talk, a group of sports movies were shown.

A "get-together" meeting of Lehigh and Lafayette branches, sponsored by the Anthracite-Lehigh Valley Section, was held on Nov. 13 in the Tatamy Fire House, Tatamy, Pa. Over 150 were present. The guest speaker was William Piper, manufacturer of the Piper Cub airplane. He discussed the early history of the development of light passenger airplanes, and recommended that more emphasis be placed on the building of many small airports rather than a few large terminals.

University of Maryland Branch

The first meeting of the season was held on Oct. 15. After a short business meeting, the members heard a talk by Dr. U. Fano, theoretical physicist and former research fellow at Carnegie Institute, of the Bureau of Standards, Washington, D. C. Dr. Fano's talk was an elementary discussion of the workings of an atomic pile. His talk brought out dramatically the tremendous difference in energy released during an atomic reaction compared to a molecular reaction.

University of Minnesota Branch

The branch opened a month of activities by acting as sponsor, with the other engineering groups at the University, for a talk by Dr. Charles F. Kettering, of General Motors. Dr. Kettering presented an interesting talk on "My Experiences."

A field trip was made to the American Hoist and Derrick Company, St. Paul, Minn., on Nov. 5, where 80 members were guests of the company. Groups of ten members each toured the plant, from the power plant and shops to the final assembly, under the guidance of plant men. On Nov. 12 the members, together with students from AIME, heard a talk by H. G. Clark of the Minnesota Department of Research, Business, and Development. Mr. Clark presented a report on Minnesota industry. Chairman Harold Danforth opened a short business meeting on Nov. 19. Mr. Umbehocker, program chairman, presented Mr. Childs of the School of Business. Seventy members present heard Mr. Childs give a talk on "Human Engineering."

Mississippi State College Branch

The meeting on Nov. 21 was opened by the

chairman, Ernest Strahan. Pins and charms were distributed. A film on the production of raw sugar in Louisiana was shown. The complete process of growing until the sugar was made was well illustrated. Forty-one were present.

Montana State College Branch

The first meeting of the school year was called to order by chairman Caleb Christian, on Oct. 13 in room 218, Roberts Hall. The following officers were elected: Ralph Smalley, vice-chairman; Joe Gibbons, treasurer; Gene Coleman, secretary. Prof. James B. T. Downs, junior member ASME, was elected to serve as faculty chairman.

On Oct. 30 another meeting was held which featured a film "Eternally Yours," giving the history of wrought iron. Chairman Caleb Christian discussed the engineering students' publication, *Montana Engineer*.

Mississippi State College Branch

A special meeting was held on Nov. 11. Prof. C. B. Burgoyne, new honorary chairman, made a few remarks in regard to his position as honorary chairman of the branch. The guest was Mr. Hook of the Anaconda Copper Company, who gave a brief talk concerning his company's open copper pit in Chile, S. A. A film was shown of this pit which carries the raw materials through a series of processes until the copper is ready for production. A discussion period followed, at which time Mr. Hook said we must conserve the metals found in the earth by the proper use of them.

University of Nebraska Branch

At the Nov. 12 meeting in 206 Richards Laboratory, a film entitled "There Is an Engineering Reason," was shown. This dealt with steam power-plant equipment such as blowoff valves, water-level indicators, and steam traps. One hundred and twenty were present.

On Nov. 19 a well-planned day included inspection of three plants and a joint luncheon meeting of the Omaha Junior Chamber of Commerce, the Omaha Engineers Club, the Nebraska Section, ASME, with the Nebraska branch as guests. Transportation was provided by student members who drove their cars and shared rides with other members. There were approximately 110 students divided among some 25 cars. The party met at the plant of the Omaha Public Power Company and inspected the 104,000-kw plant, following through the generation of power from boiler to transmission-control room. At the luncheon meeting held at the WOW Building, Colonel Sweeley of the U. S. Army, guest speaker, presented two technical papers: the first "Proximity Fuse," and the second, "Nuclear Energy." After the luncheon the students split into two groups; one group, composed of those interested in inspecting the Baker Ice Plant; the other group those interested in the Omaha Steel Works. The Baker Ice Plant revealed the refrigeration process and the equipment that go into ice making. At the Omaha Steel Works the second group followed through an interesting sequence of processes in the production of cast-iron products from pattern shop to final machining.

University of New Mexico Branch

On Nov. 4 in the Engineering Building it was announced at the meeting that the University Student Council had asked the ASME branch to obtain the number of linear feet of wall to be decorated for the homecoming football game. A committee was appointed for this purpose. The program consisted of the showing of a film.

New Mexico State College Branch

The first meeting of the new school year was held on Oct. 9. Election of officers resulted in the following: H. A. Chesney, chairman; A. P. Michels, vice-chairman; D. B. Jett, Jr., secretary-treasurer.

On Oct. 16 a movie "Marine Diesels," was the feature. H. A. Chesney gave a short talk on the advantages of ASME membership.

At a special meeting on Oct. 27, T. G. Tatone, a representative of General Controls, Glendale, Calif., gave a talk, illustrated with colored slides, on thermocouple-operated controls manufactured by his company. He spoke particularly on one type of control which operates on the millivoltage from a thermocouple placed in the pilot flame of a furnace or heater.

New York University (Day) Branch

On Nov. 25 a meeting was held in Lawrence House, University Heights campus, with 100 present. The subject of a branch newspaper was discussed and a pertinent questionnaire distributed. J. B. Reid of the Dow Chemical Company, gave a talk on "Magnesium and Its Alloys." He discussed the properties of magnesium which make this metal useful in structural work when alloyed for strength with aluminum, zinc, and cadmium. A film on magnesium was shown to supplement the talk by Mr. Reid. This film illustrated the use of magnesium properly in the shop and the proper way of treating magnesium parts. Mr. Reid then led a very stimulating discussion period.

New York University (Evening School) Branch

The first meeting of the year was held on Nov. 3 in Main Building, with a welcome by chairman Robert Jensen. Honorary chairman, Prof. E. A. Salma, member ASME, formerly student adviser at Cooper Union, was introduced. Plans for future meetings were discussed and topics chosen. Volunteers for each topic were asked to make arrangements for guest speakers and films. An interesting talk was given on spring design by August J. Kwossek, vice-chairman. Twenty-three were present.

North Carolina State College Branch

The Nov. 5 meeting, in 100 Page Hall, was called to order by vice-president Robert T. Lloyd. Prof. J. S. Doolittle, a former leader of the ASME branch at Penn State, and Dr. A. G. Guy, formerly with the General Electric Company, were guest speakers. Professor Doolittle spoke of the different branches of ASME, and the benefits they provided for the student. Dr. Guy spoke of the duties of the metallurgist and the connections the mechanical engineer has with metallurgy. Bill English was elected to the Engineers' Council. T. S. Tucker, A. B. Capper, W. S. Griffith, and L. W. Rose were appointed to the Engineers' Fair Council. Applications for some 30 prospective members were filed after the meeting. The attendance was 93.

North Dakota Agricultural College

On Nov. 6 in room 22, Engineering Build -

STUDENT (DAY) BRANCH AT NEW YORK UNIVERSITY

(Part of the Executive Committee: front row, *left to right:* William A. Roth, chairman; Prof. F. L. Singer, honorary chairman; Melvin Brown, vice-chairman: standing, *left to right* David Oxman, Joseph Mankowitz, treasurer, Daniel Schild, Eugene Lerner, and Myron L. Zaklow.)

ASME OHIO STATE UNIVERSITY BRANCH

ing, the chairman, Wallace Erickson, presented the guest speaker, Dr. Wouter Bosch, of the school of chemistry at the college. Dr. Bosch is a native of the Netherlands, and was formerly head of one of the largest paint companies abroad. He is at present head of the department of paints and varnishes at NDAC. First, Dr. Bosch showed a sound film entitled "New Land," which illustrated his lecture on "The Draining and Reclamation of the Zuyderzee." He pointed out the immensity of the project and told of the progress that had been made previous to the war. Dr. Bosch also showed slides he had taken of the damage and terrific setback done by the Germans during the war. He said that he believed his people had given the world an admirable example of expansion by conquering the sea instead of one's neighbors. There were 75 present.

University of North Dakota Branch

The Nov. 5 meeting was held in Chandler Hall, with 26 members and 13 visitors present. An Allis-Chalmers film, "Tornado in a Box," dealing with gas turbines, was shown. The suggestion was made that some incentive and recognition be provided for the members who prepare papers for the ASME Regional Convention. A committee was appointed to determine a suitable award or plaque for this purpose.

Northwestern University Branch

The first fall meeting of the branch was held in lecture room 2, Technical Building, on Oct. 31. A nominating committee was appointed to make up a list of outstanding candidates for office. Two movies were shown: the first, of the almost completely mechanized manufacture of automobile frames at the A. O. Smith plant in Milwaukee, Wis.; the second, "The Magic of Steam," a presentation of the miracle of the modern steam turbine.

On Nov. 13 the meeting was opened by chairman Bob Gerhardt. Votes for officers were taken and counted. All three candidates for vice-chairman tied at 13 votes each. Dan Fulton was elected by a show of hands. The other officers are: Chairman, Jim Carroll; secretary, George Dovenmuehl, Jr., and treasurer, Miles Lutter. Thirty-nine were present.

Ohio State University Branch

At the meeting on Oct. 23 in Robinson Laboratory, there were 103 present. A junior representative was appointed to the Engineer's Council. A movie was shown entitled "Sapphires in Industry." This Elgin Watch Company production showed the processes of reducing the full-size ruby or synthetic ruby to fine precision bearings used in precision instruments.

Three student speakers were the attraction at the meeting on Nov. 6. The first speaker, Merrill Yale, gave a talk on "Marine Engineering," in which he told of his experiences as a 3rd class engineer with the merchant marines. Victor Lagarias, first-place winner of the Fifth Regional speech contest held in Cleveland, Ohio, in April, 1947, talked on "Hints for a Prize-Winning Speech." The third speaker was Joe Yurza, whose subject was "On the Trail of the '49'rs." After a brief talk on his summer excursion to the West, the speaker took the audience on a vicarious trip through the Grand Canyon by the use of projection slides.

Oklahoma A&M College Branch

A meeting was held on Nov. 10 in the Engineering Auditorium. The speaker was John Carnahan of Coston and Frankfurt, Oklahoma City, Okla. He spoke on "Design Features of the New Oklahoma A&M College Power Plant." Eighty were present.

On Nov. 24 a meeting was held in the Engineering Auditorium, with 125 present. Leland M. Morton, chairman, presided, and introduced Guy F. Williams, member ASME, of Dowell, Inc., Tulsa, Okla. Mr. Williams presented the official film "Operation Crossroads," with introductory remarks. Dean Edward Foster, member ASME, and member of the Mid-Continent Section, spoke briefly on the advantages of membership in engineering societies. W. F. Stewart, member ASME, of Tulsa, Okla., was a guest.

University of Oklahoma Branch

On Oct. 15 in the Engineering Auditorium, Robert M. Wright, chairman, presided. Russell L. Long, student member of the branch, made a valuable contribution to the publicity of the branch by his work on the blueprint tracings to be used in the engineering buildings, and thanks were extended to him by the chairman. Prof. Frank S. Roop, junior member ASME, honorary chairman, spoke on the recent inspection trip to the Oklahoma Gas and Electric Company's plant. He also mentioned awards and prizes to be offered at the Mid-Continent meeting in December. Three movies were shown, i.e., "Distributing Heat Energy;" "Atomic Power," and "Diesel, Its Application."

The meeting on Oct. 29 in the engineering laboratory was turned over by the chairman to Nathan Horton, student-speaker chairman. Mr. Horton introduced Charles Mauck, student member, who gave a talk on "Engineering in the Cotton Gin."

He described the engineering problems in the cotton gin with the aid of slides and line drawings on the blackboard, and outlined the problems as those of hydraulics, compress and tramper, fans, and power. The advantages and disadvantages of both hand-picking and mechanical picking of cotton were ably set forth by the speaker. Bill Forney, student member, spoke on "ASME Test Code for Pressure Vessels." He explained the usefulness of the two test codes, one for unfired pressure vessels and one for fired pressure vessels. An interesting item was the relation between temperature and tensile strength of the materials for vessels. Mr. Forney described the procedure to get the highest efficiency from a joint. Twenty-eight were present.

Oregon State College Branch

Sixty engineering students made a field trip on Oct. 22 to the Chapman Manufacturing Company in Corvallis, Ore., producers of fiberboard from wood waste. They were shown the processes of grinding the wood chunks into fiber, washing of the fiber, mixing in vats with the resin binder, and the formation of 4-in. layers of the loose fiber which was compressed to a thickness of $\frac{1}{4}$ in. by hydraulic and steam presses.

On Nov. 6 the regular bimonthly meeting was held in Chemistry 201, with 60 present. Following a short business meeting, a film was shown on Norton abrasives. The audience learned not only how abrasive wheels are made and their many uses, but also how the different types of wheels for special jobs are labeled.

University of Pittsburgh Branch

On Nov. 6 a meeting was held in the Cathedral of Learning, with 177 present. The guest speaker was Richard P. Bell, manager of the paint department, Pittsburgh warehouse of the Pittsburgh Plate Glass Company. Mr. Bell spoke on the part that correct color schemes play in increasing the efficiency of workers in industrial plants. His talk was accompanied by color charts and pictures of plants before the correct color scheme was applied and how the appearance and efficiency were improved after the correct scheme was

used. The honorary chairman, Prof. Geo. L. Manifold, junior member ASME, informed the members of the results of the recent membership drive. The final count showed 126 members, the greatest number in the history of the school.

The meeting on Nov. 13, with 177 present, featured a movie entitled "Building the Golden Gate Bridge," presented by Mr. Rudoy, assistant professor of mechanical engineering at the University. This picture was loaned by Bethlehem Steel Company.

Polytechnic Institute of Brooklyn (Day) Branch

On Nov. 18 a color film entitled "There Is an Engineering Reason," product of the Yarnall-Waring Company, was shown. The narration was by Lowell Thomas. The film introduces the student to the Yarnall products, then takes him through the factory, showing him the tests used to check the equipment, and the high-speed machinery used in production. Mr. Bristol, representing the Yarnall-Waring Company, spoke at the conclusion of the showing. He elaborated upon it and answered questions. One hundred and sixty were present.

Pratt Institute Branch

On Oct. 30 a meeting was held in room 17E, engineering building, when a film of the Combustion Engineering Company was shown entitled "Building Boilers for Ships." Filmed in technicolor, the picture showed the various fabrication processes that are used to build marine boilers. Those present, numbering 70, gained a deeper appreciation and insight into the practical end of boiler construction.

The noon-hour meeting on Nov. 25 in the Engineering Building, was devoted entirely to business. Membership cards were distributed and plans for future events discussed. Thirty were present.

Purdue University Branch

On Nov. 19 S. M. Dean, chief engineer, Detroit-Edison Company, was the featured speaker. His topic was "The Engineer in the Field of Management." His address was one of the finest ever heard at Purdue. The subject was of particular interest because a large part of the membership is composed of mechanical engineers who are specializing in Purdue's production-management option, and the audience numbered 300. The membership of the branch is well over the 400 mark, with more coming in every day. Heading the membership committee is Bernie Thomas; Don Cooley is in charge of publicity; the programs are handled by Dave Copple; trips and outside inspections by Jack Evert, and refreshments and arrangements by Greg McEnneny. Student chairman is Robert Eddy. Excellent faculty co-operation is obtained through Dr. C. F. Warner, junior ASME, honorary chairman.

Rensselaer Polytechnic Institute Branch

The Nov. 25 meeting was held in room 214, Sage Laboratory, and opened by the vice-chairman, Steve Thodos. The speaker, Dr. C. J. Walker, member ASME, of the General Electric Company, was introduced by Prof. J. G. Fairfield, member ASME, of the faculty. Dr. Walker's topic was "Gas Turbines for Propulsion and Power." Dr. Walker traced the progress of gas turbines down to the present time, and showed pictures of many design features and installations. The need of bearing coolers was demonstrated. Details of the combustion chambers, blades, and compressor drives were shown. A question period was held at the end of the lecture. One hundred and forty were in the audience.

South Dakota State College Branch

On Nov. 5 the meeting was called to order by Vernon E. Bushnell, chairman. Prof. L. L. Amidon, member ASME, praised the engineering floats in the annual homecoming parade. He also mentioned the necessity for engineers to make the public conscious of them and their work. A general discussion of the joint engineers' meeting to be sponsored by the mechanical engineers was begun. It was decided that Ferdinand Albertus, as head of the meetings and papers committee will also head the committee for the joint meeting. Charles Wondra and William Kafferlin will handle the publicity. It was voted that a full page in the 1948 *Jackrabbit*, the college annual, be taken by the branch. A film was shown on the construction of a light plane. Thirty-three were present.

Stevens Institute of Technology Branch

On Nov. 6 in Jacobus Hall the meeting was called to order by V. P. William Moss who made a number of announcements concerning the year's program. The chairman, Mike Freeman, then took over the meeting and announced the guest speaker, Prof. Kenneth J. Moser, member ASME, of the mechanical-engineering department, who has recently been named associate professor. Professor Moser is honorary chairman of the branch, and chairman of the committee on student branches, Region II, ASME. He enumerated the many advantages of membership in the ASME and told how the Engineers Joint Council is constantly watching legislation affecting the economic status of the engineer and cited the recent Taft-Hartley bill as an example of their efforts. A color motion picture on die casting followed Professor Moser's talk. Seventy were present.

University of Tennessee Branch

At the meeting in Estabrook Hall on Nov. 19 the chairman, H. H. Morris, presided. The speaker was George R. Dempster whose talk was on the problems which arose, and his personal experience, in the building of the Panama Canal. Thirty-two were present.

Tufts College Branch

A meeting was held on Nov. 12 in Robinson Hall, with Carlton R. Fleming, presiding. The guest speakers were Messrs. Moran and Stoddard of Barkley and Dexter Company, Boston, Mass., designers of special-purpose automatic machinery. Mr. Moran discussed many of the typical problems confronted in the design of this specialized equipment, as well as the manner and nature of the solutions. The importance of analyzing the product with regard to its natural tendency to orientate itself was pointed out as a factor of prime importance in the design. Mr. Stoddard presented seven technicolor films on the particular machines discussed. This excellent meeting was arranged by John L. Bishop, student member. Sixty-seven were present.

Vanderbilt University Branch

On Nov. 5 in room 12, Mechanical Engineering Building, Peter Jenkins presented a paper entitled "Heat Pump." Mr. Jenkins explained the nomenclature and operation of the pump, and compared the initial cost and efficiency of the pump with that of standard heating systems. An informal discussion followed. Results of the recent membership drive, in which 69 paid members were accepted, were announced. Twenty-six were present.

University of Vermont Branch

The first meeting of the season was held on Oct. 29 in room 239, Waterman Building. Prof. R. G. Chapman, member ASME, chairman, department of mechanical engineering, discussed briefly the ASME, and distributed informative folders and membership forms to the newcomers. Election of officers resulted in: Leland S. Marshall, president; Karl S. Webster, vice-president; Ruth W. Millington, secretary; and Maurice Beliveau, treasurer. Professor Wood of the University of Vermont and former production manager of the Blake Company, St. Albans, Vt., gave a talk on "The Problems in Deep Drawing of Steel and Copper Alloy in the Manufacture of Flashlight Cases." Eighteen were present.

Virginia Polytechnic Institute Branch

A smoker was held in the Chemical Laboratory Building on Nov. 4. After a brief business meeting, the chairman of the entertainment committee provided a magician show. Fred Culpeper was the student magician and an audience of 120 enjoyed the program.

On Nov. 11 the meeting was turned over to the program committee, B. L. Johnson in charge, who presented talks by student members. E. R. Adams gave a talk on "Carrier Operations," and explained the procedure for catapulting and landing airplanes on aircraft carriers. He also conducted a question period. The next speaker was R. H. Clift whose talk was entitled "General Motor's High-Compression Engines." He told of the trend to higher compression ratios and to higher octane gasoline.

At the Nov. 18 meeting the chairman, W. G. Boggs, turned the meeting over to Dowell J. Howard, chairman of the program committee, who then introduced two student speakers. W. C. Banner gave a talk on "Mountainside Coal Mining," and Lew Litchenstein spoke on "Tennis-Net Manufacture."

Washington University Branch

The meeting on Nov. 20, with 60 members present, was a special meeting when plans for the 12th Annual Steam Men's Strut were announced by Bob Wollberg, chairman of the social committee. The treasurer announced that the membership had reached an all-time high of 125, including 60 of the 71 seniors in mechanical engineering. The new officers for the year are: Carl Ullman, president; Hall

Andreas, vice-president; Paul Henderson, secretary; and Jack Kourik, treasurer.

The 12th Annual Steam Men's Strut was held the following week. The laboratory was crowded as 250 couples danced between the pieces of equipment. A stage show featured the enactment of "Cocktails for Two" and "Smarty" a la Spike Jones, by Bill Hearst, Tom Phillips, Rolland Kluge, and Doris Millner, our mascot—the only girl in mechanical engineering. The "Steam Queen of 1947" Audrey Neiner, was crowned by Prof. F. A. "Pop" Berger.

University of Washington Branch

The second meeting of the academic year was held on Nov. 3. A movie entitled "Steam Progress," furnished by the Combustion Engineering Corporation, was shown. This illustrated the manufacture of boilers and all the various machines used in the manufacture. Ninety-three were present.

Wayne University Branch

The first meeting of the newly organized branch was held in Webster Hall on Oct. 9 in the form of an open rally. The meeting, attended by 43 students, was called to order by acting chairman John H. Hughes who briefly reviewed the proceedings that led to the organization of the branch. Prof. D. L. Perkins, member ASME, outlined the benefits and advantages received from membership in the ASME while in college and after graduation. George Scranton, junior member ASME, of the Ford Motor Company, extended an invitation to the students to attend the meetings of the Detroit Section, ASME. The acting officers are: John H. Hughes, chairman; Francis E. Heffner, vice-chairman; and Offer F. Preuthun, secretary-treasurer. Committees were appointed to draft a constitution, to apply for organizational recognition by the University, and to prepare programs for future meetings.

The Nov. 6 meeting, with 50 present, was also held in Webster Hall. Fred J. Donald read a draft of the constitution and a special meeting was called for discussing and revising the proposed constitution. Lee Baker, member ASME, head of the Chrysler Institute of Engineering, guest speaker, gave a talk on "Automotive Engineering." He described the application of engineering knowledge and practice to the development and production of motor vehicles within the Chrysler Corporation, and followed a new car from the designers' drawing boards through the various model and test stages to its completion and testing in final form and presentation to the public.

A special meeting was called on Nov. 14 to ratify the new constitution, but as a sufficient majority of the membership was not present, this ratification was postponed to a future meeting.

University of Wisconsin Branch

On Nov. 5 in the mechanical-engineering building, F. Edward Hillery, chairman, called the meeting to order. The following volunteered to act on the Activities Committee: Art Wiese, Carl F. Zickert, R. J. Mitchell, Roderick L. Smith, R. P. Wilhelms, Robert Finley, John Foley, Morrison Gillet, Donald P. Reiff, and S. S. Saminson. At the close of the business meeting the SAE joined the branch members to hear a talk given by James W. Owens, member ASME, Fairbanks, Morse and Company. Mr. Owen's topic was "The Evolution of Diesel Engine Weldment Design and Fabrication." He gave a short history of welding, pointing out the struggle that the proponents of welding had to go through to have it accepted in engineering work. By the use of slides he demonstrated how Fairbanks, Morse and Company had been able to obtain very close tolerances with welding processes, and showed how they overcame their problems. One hundred and thirteen were present.

University of Wyoming Branch

The first regular meeting of the new season, a smoker, was held on Oct. 23 in the banquet room of the Student Union. Films were shown on thermodynamics, machine tools, and the 1946 C.C.N.Y.–Wyo. basketball game. The guest speaker, Prof. Eric J. Lindahl, member ASME, head of the department of mechanical engineering, gave an interesting paper "The Organization and Benefits of ASME." Guests present included the members of the faculty of the Engineering College who were presented to the group by Tony L. Yugovich, chairman. Seventy were present.

ASME Master-File Information

Please Print — **Check Mailing Address**

Name ..... (Last, First, Middle)

Home Address ..... ☐ (Street, City, Zone, State)

Name of Employer .....

Address of Employer ..... ☐ (Street, City, Zone, State)

Product or Service .....

Position or Title .....

Notify Headquarters Promptly of Changes

Keep Your ASME Records Up to Date

HEADQUARTERS depends on its master membership file for answers to hundreds of inquiries daily pertaining to its members. All other Society records and files are kept up to date through changes processed through it. The listings in future ASME Membership Lists will be taken directly from the master file. It is important to you that it lists your latest mailing address and your current business connection.

The mailing form on this page is published for your convenience. You are urged to use it in reporting recent changes.

Your mailing address is important to Headquarters. Please check whether you want your mail sent to home or office address.

ASME Sections

Coming Meetings

Buffalo: January 15. The Park of Buffalo School Cafeteria, Snyder, N. Y. Dinner at 6:30 p.m.; meeting at 8:00 p.m. Subject: Heat Pumps, by George W. Brown, development engineer, air conditioning division, General Electric Company, Bloomfield, N. J.

Hartford: January 20. Subject: Jet and Gas Turbine Power for Aircraft, by Joseph Granfield.

Philadelphia: January 14. Philadelphia Engineers Club, Philadelphia at 8:00 p.m. Subject: Railroading (speaker to be announced). This meeting will be sponsored by the Junior Group.

January 27. Engineers Club, Philadelphia at 7:30 p.m. Subject: A Survey of Germany's Power Plants and Fuels Used, by C. A. Reid, director of engineering, National Coal Association.

January 20. Towne School, University of Pennsylvania at 8:00 p.m. Subject: Carbide Tools, Dies, and Wear-Resistant Applications, by Malcolm F. Judkins, chief engineer, Carbide Division, Firth Sterling Steel and Carbide Corporation, McKeesport, Pa.

Trenton Subsection. January 19. Cartaret Club, Trenton, N. J., at 8:00 p.m. Subject: Lifetime Continued Education of the Engineer (speaker to be announced).

Pittsburgh: January 9. Power Plant Engineering Meeting. Subject: Stokers—Motion Picture, by Otto de Lorenzi, director of education, Combustion Engineering Company, New York, N. Y.

January 27. Pittsburgh Room, William Penn Hotel. Subject: Advancements in Pressure-Vessel Design (speaker to be announced).

St. Joseph Valley: January 20. Mishawaka Hotel, Mishawaka, Ind. Subject: Emmet C. Belzer of the Bell Telephone Company, will give a talk and show movies of the Fastex Camera and the Bell Telephone Hour.

South Texas: January 21. Houston Engineers' Club, Houston, Texas at 8:00 p.m. Subject: Supersonic Flight, Guided Missiles, and Jet Propulsion, by Carl W. Files, professor of mechanical engineering, A and M College of Texas.

Youngstown: January 8. Place to be selected. Subject: The Historical Development and Use of Atomic Energy, by George E. Kidd, American Cyanamid Company, New York, N. Y.

Engineering Societies Personnel Service, Inc.

These items are from information furnished by the Engineering Societies Personnel Service, Inc., which is under the joint management of the national societies of Civil, Electrical, Mechanical, and Mining and Metallurgical Engineers. This Service is available to members and is operated on a co-operative nonprofit basis. In applying for positions advertised by the Service, the applicant agrees, if actually placed in a position through the Service as a result of an advertisement, to pay a placement fee in accordance with the rates as listed by the Service. These rates have been established in order to maintain an efficient nonprofit personnel service and are available upon request. This also applies to registrants whose notices are placed in these columns. All replies should be addressed to the key numbers indicated and mailed to the New York office. When making application for a position include six cents in stamps for forwarding application to the employer and for returning when necessary. A weekly bulletin of engineering positions open is available to members of the co-operating societies at a subscription of $3.50 per quarter or $12 per annum, payable in advance.

New York	Chicago	Detroit	San Francisco
8 West 40th St.	211 West Wacker Drive	109 Farnsworth Ave.	57 Post Street

MEN AVAILABLE[1]

EXECUTIVE ENGINEER, Columbia graduate. Operated own precision-metal-working business 33 years. Organized, administered all activities. Contributed to trade publications. Seeks connection as, or leading to, general manager or president's assistant. Resident New York, N. Y. Would travel short trips. Me-248.

MECHANICAL ENGINEER, 26, single, MS degree in ME Tau Beta Pi. Approximately 5 years' miscellaneous experience in Diesel, refrigeration, and construction work. Desires research or development in South or East. Me-249.

INDUSTRIAL ENGINEER, BS and MS degrees, 25 years' experience in organization and administration of comprehensive program of industrial engineering including plant layout, incentives, methods, time study, materials handling, standards, budgets, job evaluation, wage administration, cost reduction, foreman training, reports. Professional license Pennsylvania. Able organizer and administrator. Available as chief industrial engineer or as assistant to top-line executive. Me-250.

PRECISION INSTRUMENT ENGINEER, Cornell, ME, 1938, age 30. Five years' experience in development and mass production of fire-control equipment. Desires position in New York metropolitan area. Me-251.

STEAM POWER ENGINEER, age 32, BSME; 9 years' responsible work in steam-power-plant operation, test and design in utility and industrial plants. Me-252.

[1] All men listed hold some form of ASME membership.

PLANT OR PRODUCTION MANAGER, mechanical engineer; 20 years as industrial executive; metal and light manufacturing. Familiar: administrative, design, methods, tooling up, processing to finished product. Preferably New Jersey, New York, Connecticut. Me-253.

PLANT ADMINISTRATOR, age 26. BSME, now candidate for master's in business administration. Five years' diversified experience steam generating including manufacture. Seeking plant-administration position affording broad development. Me-254.

INDUSTRIAL ENGINEER, BSME, 9 years' experience, time studies, standards and formulas; job evaluation, work simplification, union negotiations; capable of installing industrial department. Professional license, New York. Location desired, Midwest. Me-255.

SALES ENGINEER OR MANAGER, graduate engineer, 15 years' experience all phases mechanical and electrical sales. Capable handling sales problems. Free to travel. Me-256.

MECHANICAL ENGINEER, 33, 12 years' experience, designing automatic and semiautomatic machines, punches and dies, and fixtures for metal products. Designing of equipment for experimental use, and also food-processing equipment. Me-257.

MECHANICAL ENGINEER from India, 23, single, BSME. Will get MME in February, 1948. Two years' apprenticeship in India. Desires position with American concern in India or other foreign country after required training here. Me-258.

MECHANICAL ENGINEER, MS, desires combination engineering-administrative, preferably New England. Experience includes 8 years' teaching at MIT, extensive consulting work, 4 years as aerodynamicist and development engineer in guided missiles. Me-259.

WORKS MANAGER, 25 years' experience, factory management. Production and job shop, precision medium heavy machine shop, pattern, and foundry. Excellent production and labor-relations record. Me-260.

INDUSTRIAL ENGINEER, age 24, married. BSME University of Wisconsin, MBA, Wisconsin. Recent graduate. Desires position that would apply both phases of training. Available March 1, 1948. Location preferred, West Coast. Me-261-4711-D-13. San Francisco.

POSITIONS AVAILABLE

MECHANICAL ENGINEER with experience on rotary printing presses, to serve as field man for large printing corporation. Should have machine-shop experience, be able to advise about alterations to presses, visit plants where presses are being built to co-operate with builders and advise employers of progress of work. Salary open. Ohio. W-9892-D3688.

ENGINEERS. (*a*) Manager of research and development engineering, 40 or over, engineering degree with thorough and broad engineering training and experience, both mechanical and clerical lines. $8000–$10,000. (*b*) Mechanical engineer, 35–40, to act as plant engineer. Must have experience and working knowledge to direct draftsmen; handle mechanical-power-transmission details; plan maintenance and plan for and secure bids, and supervise new installations, to direct operation of small boiler plant. $6000 plus bonus. Middle Atlantic States. W-9973.

MECHANICAL ENGINEER, graduate, 25–35, with design and testing experience covering boilers, engines, railroad equipment, and technical writing ability, to revise and prepare engineering articles and do general mechanical engineering for equipment manufacturer. $3600–$4200. Upstate New York. W-9974.

MECHANICAL DRAFTSMAN with at least 3 years' conveying-layout experience, to make sketches, layouts, and details of conveyor equipment. $3000–$4000. Brooklyn, N. Y. W-9975.

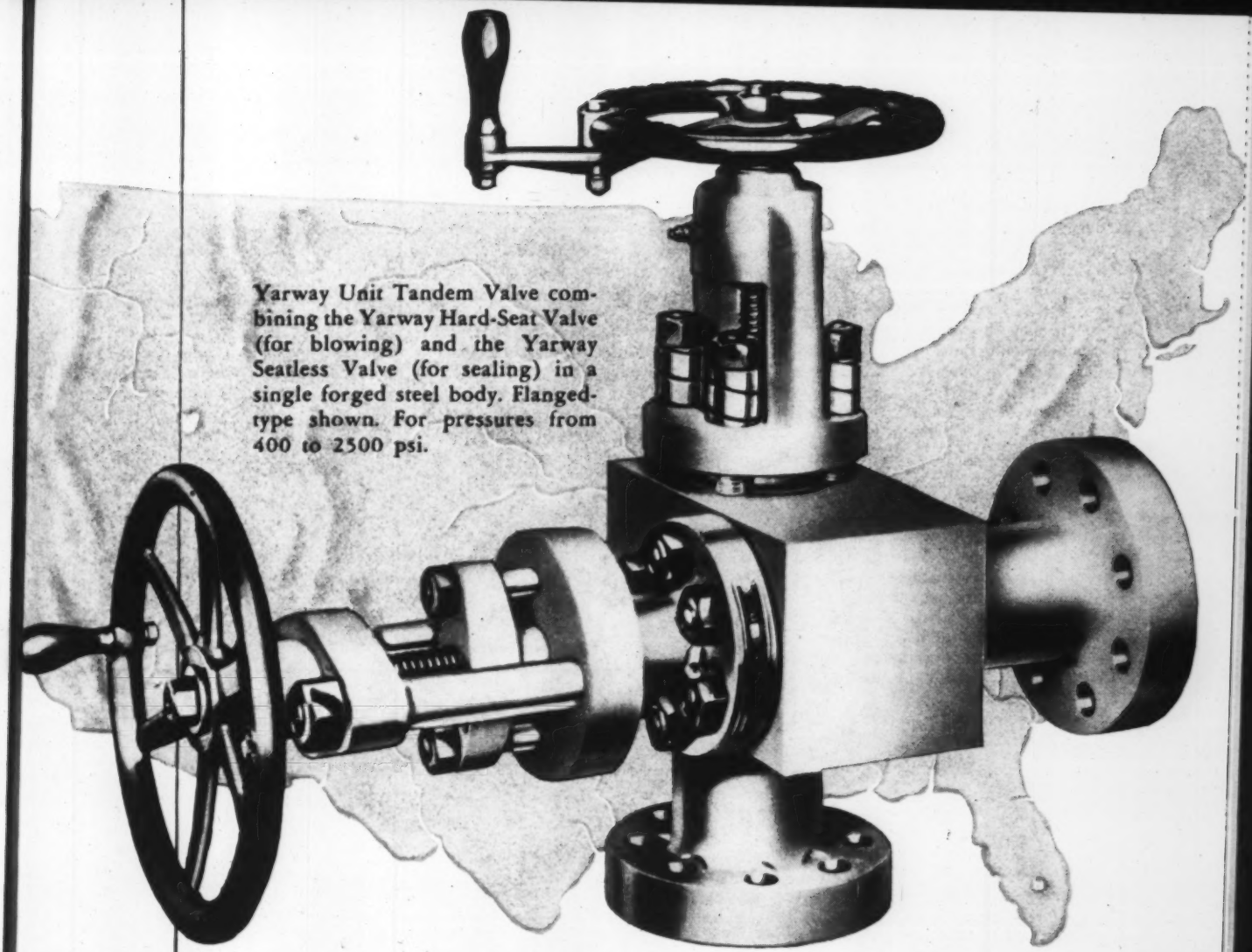
ENGINEER, civil or mechanical, 30–45, with at least 5 years' gas or water-utility experience, to plan and devise construction budgets, do job-evaluation work, and assist management of waterworks company. $5000–$6500 a year. New York metropolitan area. W-9976.

QUALITY-CONTROL ENGINEER, young, graduate, with training in application of statistical methods to quality control, to work on installation and operation of statistical quality-control plans in textile manufacturing. Westchester County, N. Y. W-9979.

ENGINEERING DRAFTSMAN, preferably mechanical graduate, to detail and lay out industrial oil burners, controls, and installations. $2600. Long Island, N. Y. W-9989.

MECHANICAL ENGINEERS, young, with experience in quantity take-off, equipment selection, and installation of air-conditioning, power-piping, and temperature-control systems. $90 a week. Louisiana. W-9992.

(*ASME News continued on page 106*)



Yarway Unit Tandem Valve combining the Yarway Hard-Seat Valve (for blowing) and the Yarway Seatless Valve (for sealing) in a single forged steel body. Flanged-type shown. For pressures from 400 to 2500 psi.

NORTH

WEST EAST

SOUTH

it's YARWAY 4 to 1

From every corner of the country comes the same story—four out of every five high pressure boiler plants are equipped with Yarway Unit Tandem Blow-Off Valves.

Each day's orders add to the evidence. From Ohio . . . 17 new Yarways, making a total of 746 purchased by this large utility over the last 35 years. From California . . . 10 new Yarway Unit Tandems for one company, 9 for another. Texas sends an order of 5 . . . 3 for one new municipal plant, 2 for another. Northern New York wants 7 for new boilers in a well-known utility. And so it goes.

Why this overwhelming preference?

Proved dependable performance, due to outstanding design, sound engineering and careful manufacture . . . plus constant research, leading to mechanical and metallurgical advancements that keep Yarway Valves ahead of changing service requirements.

For latest information on Yarway Unit Tandem Blow-Off Valves, write for Yarway Bulletin B-432.

YARNALL-WARING COMPANY
108 Mermaid Avenue, Philadelphia 18, Pa.

YARWAY BLOW-OFF VALVES

JUNIOR STAFF ASSISTANT, mechanical graduate, with 3 to 5 years' experience, particularly in plant engineering, for engineering investigation and study in connection with establishment of plant-engineering standards. Northern New Jersey. W-9993(a).

MECHANICAL ENGINEER, 35–45, engineering graduate, preferably with MS degree, with 10 years' experience on design, project engineering, and planning, especially on industrial and utility power plants, for consulting engineering office. $7000–$8500 a year. Philadelphia Area. W-9998.

DESIGNER, mechanical, for material handling of heavy equipment, i.e., slabs, billets, ingots, etc., in steel mills. Some traveling. Philadelphia Area. W-9999(a).

MECHANICAL ENGINEER, graduate, with basic technical knowledge and practical experience and maintenance public-utility thermal stations, to supervise operations and plan betterment of several steam and Diesel stations in public-utility system. Exceptional compensation for man having more than average ability and possessing supervisory experience. Reply by letter stating education, experience and give references. Location South America. Y-3.

SALES ENGINEERS, 2, electrical or mechanical graduates, under 35, for sale of electric motors, speed controls, and motorized transmissions. Territories: New York metropolitan area or New York to Troy area. $3600 plus commission. Headquarters, New York, N. Y. Y-7.

DESIGNERS, structural, architectural, and mechanical, with 5 years' experience, preferably on hotel, resident, and apartment dwellings. $6000 plus overtime. Florida. Y-8.

SALES ENGINEER, electrical or mechanical graduate, with about 5 years' experience in selling and the application of industrial electric motors from fractional hp to 123 hp, $3000–$4000. New York, N. Y. Y-9.

DESIGN ENGINEER, mechanical, with 5 years' experience in design of small electromechanical mechanisms. $5000–$6000. Connecticut. Y-11(b).

MECHANICAL DRAFTSMAN with at least 3 years' construction-layout experience, to detail and lay out plumbing and sanitary facilities for public buildings. $3770. Brooklyn, N. Y. Y-25.

TOOL DESIGNER, mechanical graduate, with at least 10 years' experience, to design tools, fixtures, and dies for manufacturer of vending machines. $5000–$6000. New York metropolitan area. Y-26.

ASSISTANT EDITOR, preferably mechanical graduate, 27–33, with at least three years' technical writing and publishing experience, to prepare technical and descriptive articles covering automobiles, trucks, and accessories. $3000–$4000. New York, N. Y. Y-29.

CHIEF PROJECT ENGINEER, 32–50, mechanical graduate, with 10 years' or more experience in process and equipment development, preferably on textiles. Should have ability to assume responsibility for a large project, and direct the work of other engineers. Will be responsible for planning and analyzing project, soundness of design, correctness of calculations, meeting time schedules, and meeting project cost estimates. Salary $7500–$8500. Location Connecticut. Y-31.

LAYOUT DRAFTSMEN, DESIGNERS, 2, preferably graduate mechanical engineers, to do layout drawings for automatic-packaging machinery. Some simple calculations regarding gearing, etc., knowledge of pneumatics and hydraulics desirable. About $5200. New York, N. Y. Y-37.

PLANT ENGINEER, 30–45, mechanical graduate, with at least 5 years' experience in maintenance and production, to supervise maintenance, equipment layout, and assist in production planning for package-goods manufacturer. $6000–$7000. Northern New Jersey. Y-42.

JUNIOR OR ASSOCIATE ENGINEER, 21–30, mechanical or chemical degree, for process-engineering work concerned with the design, development, test, and processes for the food industry. Salary open. Northern New Jersey. Y-45.

DESIGN DRAFTSMAN, mechanical, with at least 5 years' experience, to design and lay out heating, ventilating, air conditioning, plumbing, and process piping. Salary to $5400 Long Island, N. Y. Y-46.

MECHANICAL ENGINEER with experience in plastics industry, to prepare specifications, make quotations, and handle correspondence covering moulding machinery, extrusion equipment, etc. Knowledge of Spanish desirable. $3600–$4200. New York, N. Y. Y-61.

ESTIMATING ENGINEER, not over 40. Should have experience with the spreader-type stokers and have a good background in the boiler field. Position permanent. $4800–$6000 Minnesota. R-4622C.

MECHANICAL DESIGNER, graduate, 35–45, with several years' experience in the design of intricate automatic machines, preferably in the food, tobacco, paper, or clothing industries. Do not want automotive or machine-tool experience, but versatile designer on special intricate packaging and mechanical-handling equipment. Must be capable of handling a crew of designers and preferably possess a few patents. Salary open. Michigan. D-3687.

Candidates for Membership and Transfer in the ASME

THE application of each of the candidates listed below is to be voted on after Jan. 26, 1948, provided no objection thereto is made before that date, and provided satisfactory replies have been received from the required number of references. Any member who has either comments or objections should write to the secretary of The American Society of Mechanical Engineers immediately.

KEY TO ABBREVIATIONS

Re = Re-election; Rt = Reinstatement; Rt & T = Reinstatement and Transfer to Member.

NEW APPLICATIONS

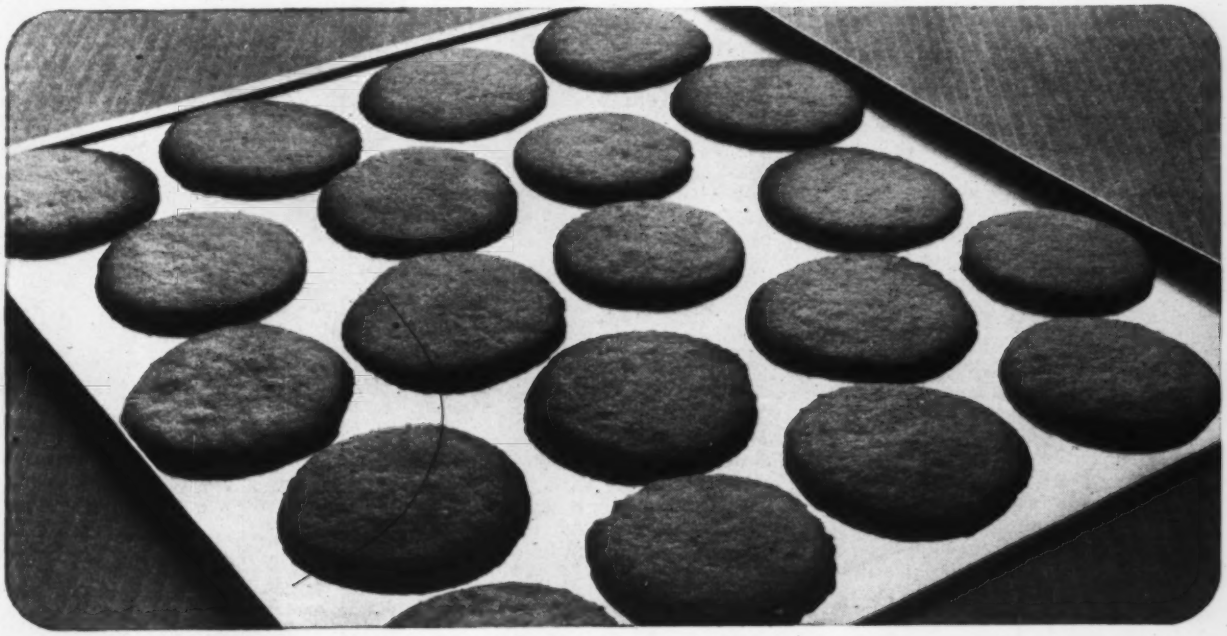
For Fellow, Member, Associate, or Junior

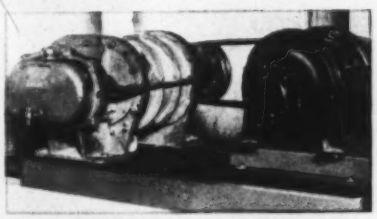
AGARWAL, OMPRAKASH, Calcutta, India
ALLEN, ROBERT D., New Orleans, La.
ANDERSON, NEWTON H., Santa Monica, Calif.
APPLETON, H. M., Verona, N. J. (Re)
ATTWOOD, FRED B., Chicago, Ill.
BACHMAN, GEORGE A., Reading, Pa. (Rt & T)
BARTON, RAYMOND LEONARD, Los Angeles, Calif. (Rt & T)
BATORI, STEPHEN MICHAEL, Eugene, Ore.
BAUER, OLIVER F., East Rochester, N. Y.
BEEMAN, FLOYD W., Chicago, Ill.
BELL, LAWRENCE FRYE, Pasadena, Calif.
BINNER, C. RANDOLPH, Hempstead, N. Y.
BOWES, VINCENT EDWARD, Flushing, N. Y.
BOYD, WALTER A., JR., So. Orange, N. J.
BRIGHT, RICHARD R., St. David, Pa.
BRINSON, LEO T., JR., Arapahoe, N. C.
BRONAUGH, JOHN READER, Endicott, N. Y.
BROWN, GLEN E., Towson, Md.
BROWN, RALPH E., Kingston, R. I.
BURT, HOWARD H., Youngstown, Ohio
CANDLER, WILLIAM J., Torrington, Conn.
CARTER, CHARLES WILSON, San Diego, Calif.
CLARK, ALVAN LLOYD, Toledo, Ohio
CONWAY, H. D., Ithaca, New York
CORF, JOHN ROBERT, Norwalk, Ohio
CORLESS, ROBERT J., Houston, Texas
COULTER, BOLDEN MCKEE, JR., Los Angeles, Calif.
DE LANVERSIN, HENRI, New York, N. Y.
DENLIKER, GEORGE G., Plainfield, N. J.
DRENKER, EDGAR W., Lincoln, Neb.
EADES, WILLIAM H., Petersburg, Va.
ELLIS, GREER, Pelham, N. Y.
FAVARY, ETHELBERT, Hollywood, Calif.
FEENEY, EDMUND J., Newark, N. J.
FISKE, AUGUSTUS HENRY, JR., Schenectady, N. Y.
FLANAGAN, THOMAS LEONARD, Merrick, N. Y.
FLEISCHMANN, MARTIN, Canton, Ohio
FLODIN, JOHN, Washington, D. C. (Rt)
FOOTE, EARLE GARVIN, Seattle, Wash.
FOSTER, J. LEWIS, Wichita Falls, Texas
FOWLER, JAMES R., Seattle, Wash.
FRASER, WILLIAM A., Philadelphia, Pa.
FREARK, DORMAN G., Hoboken, N. J.
FRENCH, JOHN M., Boston, Mass.
FRENGER, WALTER H. St. Louis, Mo.
FRIED, LAWRENCE, San Francisco, Calif.
FULTON, ANDREW C., Media, Pa.
GAINES, WALTER EARL, Winston-Salem, N. C.
GARRISON, EDWARD W., Bridgeport, Conn.
GIDWANI, HARKISHIN LAKHIMAL, Warwickshire, England
GILES, ROBERT F., Savannah, Ga.
GITZENDANNER, F. A., Chicago, Ill. (Rt & T)
GOAT, W. RICHARD, Brooklyn, N. Y.
HAFER, A. DON, Ferndale, Mich.
HALLET, HAROLD ADRIAN, Chicago, Ill.
HARDEN, CARL, Pasadena, Calif.
HARPER, C. H. D., Gordon, N.S.W., Australia
HARRIS, SAMUEL ALEXANDER, Winston-Salem, N. C.
HATTERY, CHARLES EDWARD, Middletown, Ohio

(*ASME News continued on page 108*)

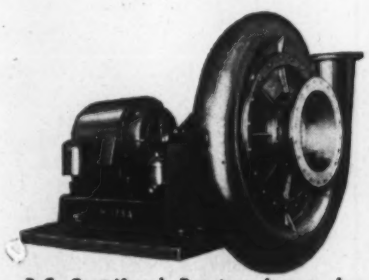
The first Rotary Positive Blower built by anyone was produced in the "Roots" plant in 1854—six years before the first pony express. We're not good because we're old, we're old because we're good!

GRANDMA LIVED 90 YEARS TOO SOON





R-C Rotary Positive Blower built into modern gas-oven equipment to maintain constant, correct gas flow for even baking temperatures.



R-C Centrifugal Boosters insure deliveries of gas in sufficient quantities, at the right pressures for home, commercial and industrial users.

When she made those mouth-watering cookies, Grandma didn't have perfect baking temperatures, obtained from an even flow of gas. Even though "Roots" equipment was available almost 100 years ago, neither home nor commercial bakers had learned how to apply it to making cookies.

Now, it's different. Roots-Connersville Rotary Positive or Centrifugal Gas Pumps and Boosters help regulate gas and air supplies for every industry, where reliable performance is essential for profitable operations.

With our *dual-ability* to supply either *Centrifugal* or *Rotary Positive* equipment, we can match capacities, pressures and other factors to the job to be done . . . with complete impartiality. For any work of handling air or gas—ask R-C *dual-ability* to do the job faster, better, cheaper.

ROOTS-CONNERSVILLE BLOWER CORPORATION
801 Michigan Avenue, Connersville, Indiana

ROOTS-CONNERSVILLE
ROTARY CENTRIFUGAL
BLOWER BUILDERS R-C SINCE 1854
BLOWERS · EXHAUSTERS · BOOSTERS · LIQUID AND VACUUM PUMPS · METERS · INERT GAS GENERATORS

★ ★ ONE OF THE DRESSER INDUSTRIES ★ ★